

POPULAR Computing WEEKLY

SOFTWARE

Locoscript 2

The answer to
PCW owners'
prayers?

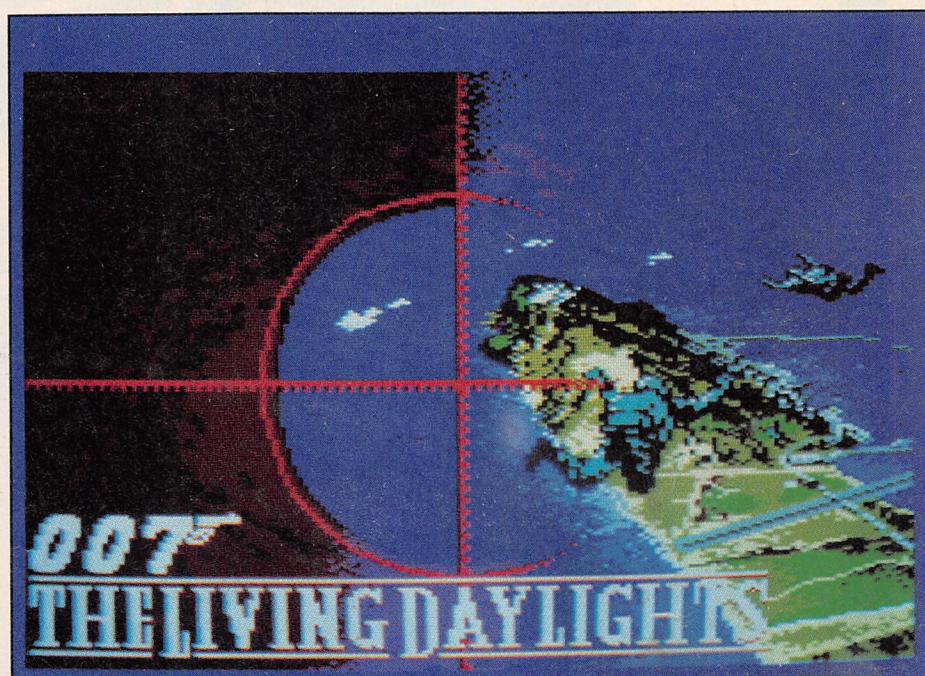
HARDWARE

Fast print action:
the new MP-480
multi-head
dot matrix

GAMES

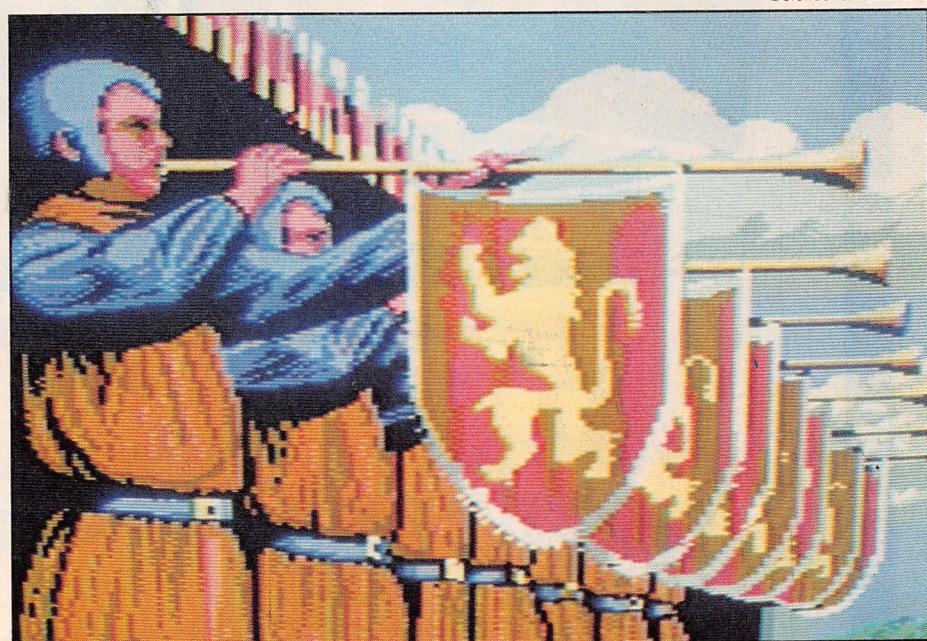
Bond is back in
The Living
Daylights

Defender of the
Crown - Merrie
England on C64



The Living Daylights

Defender of the Crown



News Desk . . . 288 deliveries begin

ATARI

COMMODORE

SPECTRUM

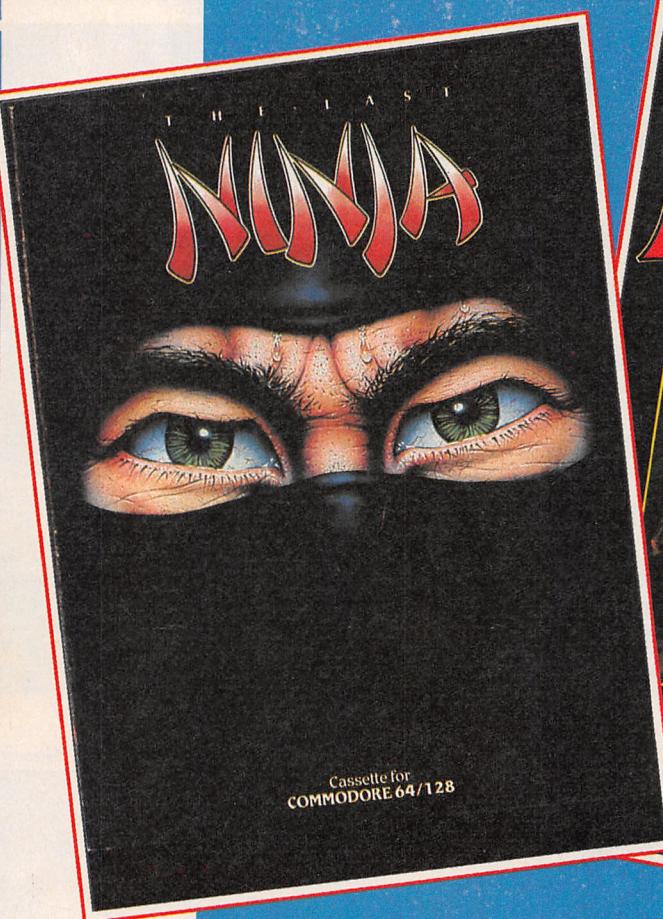
SPECTRUM

COMMODORE

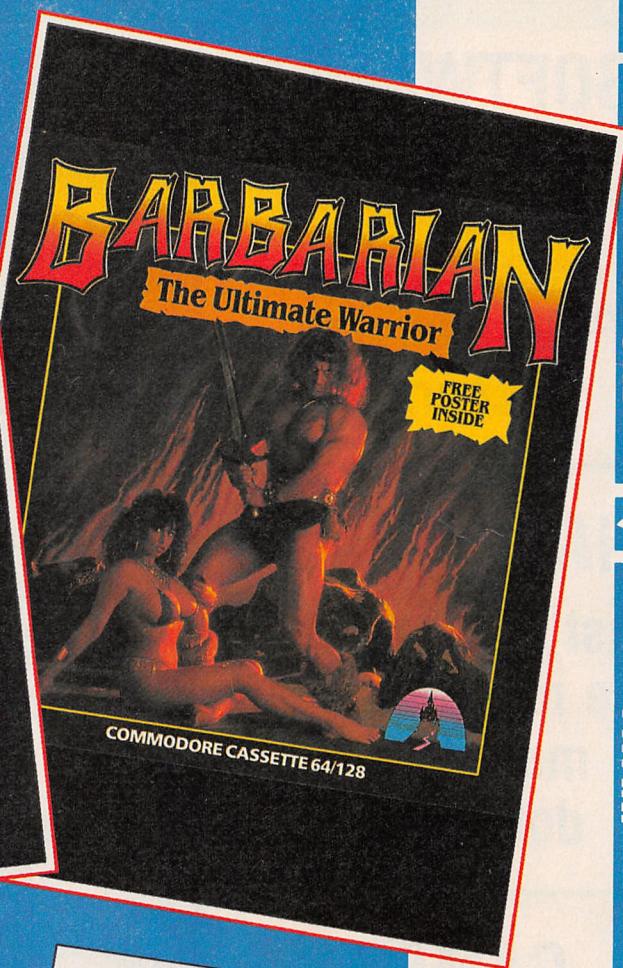
AMSTRAD

ATARI

NEW RELEASES



Cassette for
COMMODORE 64/128



COMMODORE CASSETTE 64/128

The Last Ninja

BARBARIAN
The Ultimate Warrior

WOOLWORTHS

A Great Deal in Entertainment

COMMODORE

SPECTRUM

AMSTRAD

SPECTRUM

AMSTRAD

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ATARI

AMSTRAD

July 3-9

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The Communications column will be back next week.

Features

12 Microperipherals' MP-480 printer Tony Kindle tries out this new dot matrix printer, which boasts no less than four separate print heads for fast operations.

14 Locoscript II Finally finished, finally available. The upgrade to the original word processor bundled with the Amstrad PCWs is faster, more flexible and better ordered. Christina Erskine reports on a possible answer to a PCW owner's prayer.

Programming

18 First Steps in machine code In this, the final part of our machine code series, Kenn Garroch explains the use of simple look-up tables.

22 Listings We kick off this week with Soccerboss - guide your chosen team through the four divisions, the FA Cup, and, a bonus for English fans, into the European championships.

Khanda 2, the Amstrad CPC game, has reached the home straight; for the Commodore 64, we've a routine which enables you to use an on-screen calculator while working on your current programs.

Then there's the start of our joint project for the BBC and ST - get them talking to each other, sharing Basic files, and generally proving to be a lot more compatible than they look.

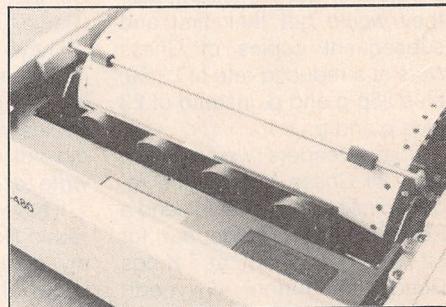
Finally, our apologies to Memotech owners; part of last week's Panel Copy listing went astray. All is put right this week.

29 Bytes and Pieces Short routines for you to type in.

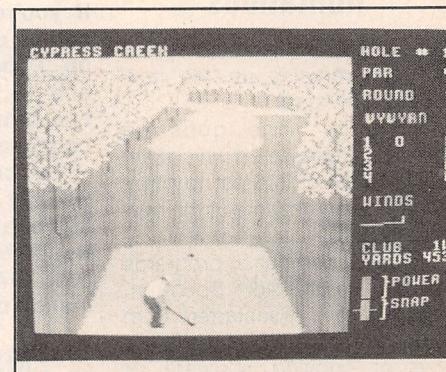
30 Peek and Poke Kenn Garroch answers your programming queries.

Games

40 New Releases Your complete guide to all the games released this week, including Domark's new James Bond game *The Living Daylights*, *World Class Leaderboard* - more courses, more bunkers, more trees - from US Gold, and for something completely different, *Defender of the Crown* for the Commodore 64.



Top: Acorn's ARM micro.
Above: Microperipherals' MP-480 printer. Below:
World Class Leaderboard



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ABC

How to submit articles Articles which are submitted for publication should not be more than 2000 words long. The articles, and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here - so please do not be tempted. We cannot guarantee to return your programs - so please do not send your only copy. **Accuracy** Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

Popular Computing Weekly. Tel: 01-437 4343.

Nuts about chess

If readers are enjoying the chess games against *Colossus*, they may be interested in a program I have written for the Spectrum 48K called *Chess Nuts*.

It contains a database of all the games played in the 1986 World Championships between Kasparov and Karpov.

The games can either be watched or played through with the user trying to emulate the masters' play.

Also included in the program are 50 Mates in Two, Five Games to Test Your Chess, and 15 interesting short games.

I hope to start a club eventually (if response is good), with the idea of bringing out further editions of *Chess Nuts*, and members would be able to have their own games included in the program (if good enough); also they would get their first and subsequent copies of *Chess Nuts* at a reduced rate of £2.50, plus 25p p and p, instead of £3 plus p and p.

If any readers would like a copy of *Chess Nuts* at the reduced price, they should send a PO or cheque, made out for £2.75 to P T Cimatti at 7 Kings Road, Llandudno, Gwynedd LL30 2BZ.

P T Cimatti

Spectrum disc limitations

I have read with interest your recent articles on the new Spectrum Plus 3.

However, one question remains unanswered which I am sure will be of interest to other would-be purchasers of the new machine.

I have a number of programs for use on the 48K Spectrum which I have transferred from tape to microdrive, without the use of copying software or 'magic boxes'. Would it therefore be possible to transfer such programs from tape to disc to use on the new Plus 3?

If the disc system is only for use in 128K mode and it is not possible to transfer 48K programs then I fear that the success of the new machine with a price tag of £250 will be limited.

Perhaps you would publish the answers to the above question as soon as possible so that would-be purchasers like myself

will understand the limitations of the disc system before parting with their cash.

Phil Ward
Wakefield

You should be able to transfer tape programs in Basic to disc using the CAT command from the Plus 3 DOS. Other programs will be more tricky, but see our review of Rockfort's updated Disciple interface (*Popular*, June 26) which could come to the rescue here.

Microdrives are not, however, catered for in the Plus 3.

The disc system on the Plus 3 can be used in both 48K and 128K mode.

Radio communications

I am writing about an article in a 1983 edition of *Popular Computing Weekly* on RTTY (Radio Teletype).

I have just become interested in this sort of communication while looking through old copies of *Popular*. The article did not contain an address to write to for information on RTTY.

I have a Spectrum 48K and would like to transmit RTTY on my computer. I would like to know if I am able to buy equipment somewhere nearby, plus any other information you could give me.

Chris Smales
York

If you're going through old copies of the magazine, look up *Popular*, September 11 and 18, 1986, when we ran two further articles on radio communications.

Try contacting the Radio Society of Great Britain at Lambda House, Cranbourne Road, Potters Bar, Herts EN6 3JW (0707 59015) for information on kit and dealers.

MSX upgrade warning

The letter entitled *Upgrades for MSX 2* (*Popular*, June 19) contains information which is either duff or out of date.

Being a fanatical MSX user myself I walked down to 374 Hesle Road, Hull, in a fruitless attempt to purchase the cartridges for my machine. 374 Hesle Road is now a small shop called Ritina's Cooked Meats and Bacon.

The shopkeeper did say, however, that the shop used to be some kind of video library, so there may still be hope for us yet.

I would suggest that MSX users do not send cheques or money orders of any kind to the above address.

Paul Hanson
Hull

See Commodore for comment

Do you think you could show a bit more support for the 8-bit Atari range instead of always towards the ST?

Thanks for the word processor review a few weeks back – but how about some reviews instead of always, "see Commodore 64 entry for comment"?

Adam Fenner
London

When software is released simultaneously on a number of machines, we try to make the reviews/comments applicable to all versions – certainly as many as we've been able to test.

Printing "see C64 for comment" doesn't mean the comments aren't relevant to other versions, it's just that there's no point in repeating ourselves.

The lone ST defender

I have been following the debate on ST versus Amiga with some interest, since it parallels a debate on Compunet in which I seem to have been the lone defender of the ST. Like you I seem to have been on the receiving end of a torrent of abuse from Amiga fanatics!

I don't know what it is about the Amiga that inspires such devotion on the part of its owners – perhaps they are worried that they made the wrong choice!

Technically the Amiga is a better machine, but there is little chance of Commodore UK being allowed to sell it at a reasonable price, to do so would undercut the West German market. The profit of the West German market was the foundation on which Commodore's world-wide recovery was built – and I doubt if Commodore will jeopardise that to sell a few more machines in the UK.

The recent Commodore show was the writing on the wall – the upstairs which had most of the Amiga material had only a fraction of the downstairs section which housed the 8-bit software!

Incidentally, both the ST and the Amiga have still to reach the quality of the material regularly produced in games for the C64...

Alan Lenton
London SW6

The final solution

Each week in *Popular* I read in the letters page the views of various people regarding their respective machines and their individual merits. I do wonder what these people use their Amigas and STs for. I can't really believe that they are all red hot C programmers or whatever. As for games use, it does seem a little extravagant.

May I offer a solution? I have had a Spectrum for several years now, and it still seems to have the widest and cheapest software base, mainly games, but with a good range of "serious" software, *Tasword*, etc. This software is at least educational, if not genuinely useful in the office.

For my "serious" work, I have now got an Amstrad PC. Yes, I know it's ancient technology, etc, but it is still a huge step ahead for a home user. Like the Spectrum, the software base is huge, and most importantly the machine is, of course, compatible with the machines at work, with all that that implies. Unlike the Amiga!

Also, think about running costs. $5\frac{1}{4}$ inch floppies are a lot cheaper than the microdrives I used to use, or $3\frac{1}{2}$ inch discs for that matter.

16 bit software can be prohibitively expensive for the home user. If you look in the public domain, you will find all the software you'll ever need. For example, the Amstrad's Basic 2 is not IBM compatible. Get the shareware *Prado-Basic* and your troubles are over. I strongly recommend *PC Star*, of Cardiff (see advert in back issues of *Popular*). It is not into profiteering, most discs are just £3.00. Note your moral obligation to support the software's author.

R Pitman
Worcester

Taipan confusion

Today I was looking through the back issues of *Popular Computing Weekly* and this certain issue was January 6 1983. At the back in the classified section was an advertisement which said:

TAIPAN
A game for
DRAGON 32

Be the James Onedin of the FAR EAST. Make your fortune trading and so on. Also available for the ZX81 and ZX Spectrum PRICE £4.95 JAYSOFT 6 Wentworth Drive Bishops Stortford, Herts

After reading this I remembered that I had seen the same title in the News Desk section of *Popular*, May 29, 1987. This said: Ocean releases one of its most ambitious projects to date next month: *Tai-pan*, a tale of buccaneering off the Chinese coast, based on the James Clavell novel.

Surely this can't be the same as the other version four years earlier for the Dragon 32, ZX81 and ZX Spectrum. Both games seem to be based on roughly the same ideas of pirates and the Far East and adventure . . . but maybe it is just a coincidence about the two games with nearly the same titles. But there again, maybe it is not.

Edward Jones
Colchester

Ocean says there is no connection between the two whatsoever - and would like people to note that its *Tai-pan* is officially licensed from the novel, rather than a general game about an oriental merchant prince, which is what a *taipan* is.

Gunship loading solution

Further to T A Kelly's letter on the problems of tape loading *Microprose's Gunship*. The failure to load the Summary/Debrief sections of the program appear to be more the cause of a bug in the program rather than faulty head alignment of the trusty C2N.

What appears to be happening while you are attempting to complete a mission is that the



"Johnson here is one of our High Flyers"

tape motor is started every now and again. The cause of this only Microprose can answer.

Anyway, once you have completed a mission the tape is no longer in the position it should be and therefore fails to load the relevant sections. Very distressing when you feel that you deserved some sort of medal for what you went through.

There is, however, a solution to the problem as follows:

1) After arming, turn over the tape and rewind *but* reset the counter *before* pressing a key as instructed.

The mission should now load and the tape should stop at 129 (approx).

2) Play the game as normal and when you press 'n' when asked to retry the mission, allow the program to search for the next section of the program. If the counter reaches 136 the program has failed. Stop the tape, rewind to 127 and press play again. The summary and subsequent sections of the program should now load. If not then the tape heads should be checked.

C J Moore
Dumfries

Rotronics support group

In *Popular*, June 12, there was a letter from a T Merrigan wanting to set up a user group for the Rotronics Wafadrive, as there wasn't one in existence. Well, in fact, there are two!

My organisation, the Wafa Register, is a free (that's why I

don't advertise) mutual aid and support organisation for those bereft of Rotronics Ltd, seeking solace (and a new source of Wafas). It has a presence on Micronet 800 via my mailbox (053258704) and has a listing on the "Next" teletext pages on BBC2, Ceefax page 702.

Access can be provided to the very useful Rotronics information sheets and members can swap program conversions to Wafadrives. One company is offering Wafadrives at £14.95, but I am not sure these will or can be made to work with the Spectrum.

D Beastall
Leeds

Amiga vs. Atari: the facts

Here are some facts about the Amiga which will convince people that it is a better buy than the Atari ST.

Graphics: sprites, scrolling, area filling, line drawing, all in hardware. Powerful blitter for complete bitmap manipulations, etc. (Note: Atari blitter is nowhere near as powerful as the Amiga's and not fitted as standard, so software houses won't use it.)

Coprocessor (no need for jerky master interrupts).

Flexible Display modes from 320 by 256 with 4096 colours to 640 by 512 with 16 colours.

Sound: four channels, each capable of reproducing the sound of an entire orchestra.

Expandable: up to 8Mb fast access Ram plus 512K video Ram. Add up to three extra 880K 3½ inch drives.

Hard discs, sound samplers, video digitisers available now.

Software: not as much as the ST at the moment, but there will be plenty from the US soon. It will catch up and overtake the ST. Remember what C64 software was like before US Gold made its software houses wake up and take notice of it.

Finally: if people wanted a computer with more software available but with inferior hardware then why did any computer ever replace the ZX81 as the market leader?

The Amiga costs a bit more but offers a great deal more!

D C Taylor
Street, Somerset

Colossus on the defensive

In Game Two of our Readers' versus *Colossus* chess tournament, the readers, playing white, have got *Colossus* on the defensive. The vote this week went to moving the e-file rook to e3, *Colossus* has moved its remaining rook into the open, but progress is going to be difficult.

The next move

What would you suggest to consolidate this position?

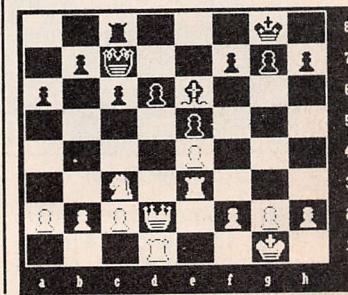
Send your suggested readers' move to either Inter-Mediates (*Popular Chess*), Freepost, Sawbridgeworth, Herts CM21 9YA (no stamp needed), or *Popular Chess*, Unit 2, The Maltings, Sawbridgeworth, Herts CM21 0PG (with a stamp). Please note that Freepost is slower than the normal service, so if you want to save stamp money, get your entry off promptly.

Only one vote per person please, and all entries must reach either address by Wednesday, July 8.

The move which gets the most votes will be entered into the game. Results and *Colossus*'s response will be published in two weeks' time.

Game Two

1	Pe2-e4	Pc7-c5
2	Ng1-f3	Nb8-c6
3	Pd2-d4	Pc5xd4
4	Nf3xd4	Pe7-e5
5	Nd4-b5	Pa7-a6
6	Nb5-d6+	Bf8xd6
7	Qd1xd6	Qd8-f6
8	Qd6-d1	Ng8-e7
9	Nb1-c3	Pd7-d6
10	Bc1-e3	Ke8-g8 o-o
11	Bf1-e2	Bc8-d7
12	Ke1-g1 o-o	Re8-c8
13	Qd1-d2	Nc6-d4
14	Ra1-d1	Nd4xe2+
15	Nc3-e2	Rc8-c6
16	Be3-g5	Qf6-e6
17	Bg5xe7	Qe6xe7
18	Ne2-c3	Bd7-e6
19	Rf1-e1	Qe7-c7
20	Re1-e3	Rf8-c8
21	?	



Price cuts across BBC range

ACORN has cut prices across its existing BBC range, following the launch of the RISC-based Archimedes machines last month.

The cuts represent a 15 per cent reduction overall. The Master 128 goes from £511 to £469, the BT from £409 to £387, the Master Compact – the system which uses a monitor – from £452 to £410. The TV system, including a modulator, goes down from £460 to £427, the Master Compact mono system from £551 to £469, and the colour unit from £704 to £645.

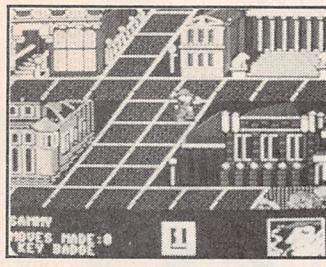
Acorn public relations chief Michael Page denied that the move in any way marked the replacement of the existing range by Archimedes.

"Because we see the Master as continuing to sell, we had to adjust the prices.

"We see that existing machines are very much part of a coherent range meeting needs in specific areas," he said.

Sherlock for Atari

US GOLD has released the Atari 800XL version of Data-soft's 221b Baker Street, based on the board game of the same name. You take the part of Sherlock Holmes, Dr Watson, Irene Adler or Inspector Lestrade – characters from the Conan Doyle *Holmes* stories – to beat other players to solving a number of crimes.



221b Baker Street

221b Baker Street costs £3.99 on tape and £14.99 on disc and is also available for the Commodore 64.

End in sight for Z88 buyers

DELIVERY of Sir Clive Sinclair's Z88 portable computer finally got underway last week – three months after it was advertised.

"We started shipping them out last Saturday, and we should be up to date within two weeks," said Sir Clive.

This announcement could mean the long wait is nearly over for customers who ordered the Z88, either from the *Which Computer?* Show or from an advertisement in the March 1987 issue of the same magazine.

The Z88 has failed to meet a number of delivery deadlines. Sir Clive Sinclair has claimed the problems have ranged from bugs in the software to awaiting BART approval for the modem.

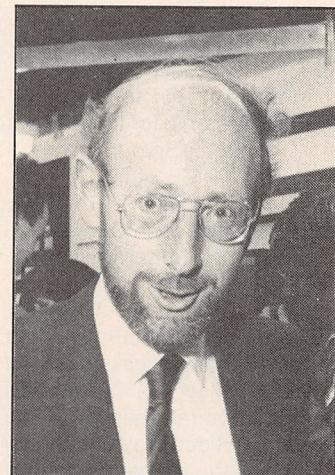
He and his company Cam-

bridge Computers have been strongly criticised by the Advertising Standards Authority over the whole Z88 affair.

And last week it emerged that the Advertising Standards Authority is to uphold complaints it has been investigating about the advertising for the machine.

No date had been mentioned in the *Which Computer?* advertisement when customers could expect to receive their machines. This was in breach of the Code of Advertising Practice, and the Authority intervened.

Sir Clive – who five years ago said "If we announce a product now, it is because it is ready for production" – refused to comment last week on the ASA



Sinclair: criticised

decision. The full findings of its report into the Z88 affair won't be made public until next week.

Utilities: price cuts & add-ons

THE successful Basic for the ST, GFA Basic, has been reduced in price, and the next few months will see a number of additions to the GFA Basic range.

The Interpreter and Compiler will now cost £45.95 instead of £59.95. Publisher Glentop Press is also making a summer special offer of three free discs of public domain software to new registered GFA Basic users.

There are three new GFA products to be launched during the next few weeks. First up will be GFA Vektor, a 3-D graphics package which allows images to be created, manipulated and incorporated in a GFA Basic program. This should arrive

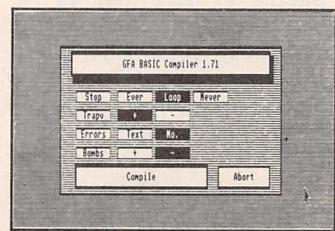
later this month.

August sees the release of GFA Draft Plus, a 2-D drafting program compatible with GFA Basic and GFA Draft. Also in August comes GFA Object, another 3-D design program which will show images from any viewpoint, add perspective, and transfer images to Draft Plus or GFA Basic for further manipulation.

Finally, September sees the release of GFA Float, which allows access to the Mega ST's maths co-processors.

Prices are still undecided, but Vektor is likely to cost in the region of £39.95, Draft Plus about £100, and Object should be about £50-£60.

Further information is avail-



GFA Basic

able from Glentop Press, Standfast House, Bath Place, High Street, Barnet, Herts EN5 5XE, Telephone 01-441 4130.

● And Arnor has chopped the price of two of its utilities. Maxam 2 and the C linker were both £79.95, now £49.95.

Further information from Arnor, Protekt House, Wainman Road, Peterborough PE2 0BU, telephone (0733) 239011.

Puzzle over 'charity' cash

TRADING Standards officials were last week investigating a Surrey based company which has been using names of charities for AIDS victims and the Ethiopian famine to obtain money.

Ahmed Innovations and Research had announced its ST emulator for the Amiga (see *Popular Computing Weekly*, April 17).

The STimulator was available for £15, plus an extra £5 payable to one of six named charities, including the AIDS charity, the Terence Higgins Trust, Childline and the Oxfam Ethio-

pian Fund.

It now appears that the company has not sent out the goods as ordered, and the whereabouts of the directors – and the customers' money – is uncertain.

AIR directors Hassan Ahmed and Alan Price claimed that this was due to a "small delay" when contacted several weeks ago. But customers' calls have continued, and Ahmed and Price could not be contacted last week.

Representatives of some of the charities concerned were unaware of AIR's 'fundraising'

activities. A spokeswoman for the Imperial Cancer Research Fund suggested that AIR might have used the charity connection as a means of adding to its mailing list.

Kingston trading standards officials have been alerted, and their investigation was getting under way as *Popular Computing Weekly* went to press.

Anybody with information concerning Ahmed Innovations & Research Ltd, or who has sent money to the company, should contact the *Popular Computing Weekly* News Desk on 01-437 4343.

NEXT WEEK

The Z88 portable

Has Sir Clive done it again? Could the Z88 herald his return to the fold with his new company Cambridge Computers? Now that the Z88 is truly finished and ready to sell to customers, we look at the machine and its capabilities in depth.

Graphics

Computer graphic artist Paul McKinley begins a new series on how to get the most out of art packages – how to use their functions to the best effect. And you don't need to be inherently artistic to implement Paul's suggestions.

Spectrum Beta Basic 4.0

Compatible with Spectrum Basic, this new version of Beta Basic from Betasoft, for 128K Spectrums, adds new functions and procedures, including a turtle graphics facility. Duncan Evans puts it to the test.

Arnor C Compiler

Kenn Garroch takes to the high C's, with a look at Arnor's C, the latest contender in the range of implementations of this currently popular language. For CP/M Plus computers.

Competition results

We name the winners of our Mastertronic day out at Silverstone competition: the three contestants who win the trip, and the tee-shirt winning runners-up.

Commodore bundles A500

COMMODORE UK has announced a special bundling deal on the Amiga A600, featuring Electronic Artist *Deluxe Paint* – normally £93 inclusive.

The company claims that the graphics program has already been sold to 80 per cent of Amiga owners worldwide.

The deal applies immediately, and a Commodore spokes-

woman confirmed that the package will be available indefinitely from all Commodore dealers.

"The creative graphics possible with *Deluxe Paint* make an unbeatable introduction to the Amiga's capabilities," said Commodore sales manager Tom Hart.

For Electronic Arts, European

Publishing director Mark Lewis commented: "We are delighted that Commodore have decided to introduce new Amiga owners to Electronic Arts."

Summer is usually the time when Commodore announce a bundling deal on the 64, but a company spokesman this week denied that such a deal was imminent.

Pattie's successor at IT

JOHN Butcher has been appointed as the new government minister responsible for Information Technology.

His appointment, in the recent reshuffle following the General Election, as an Industry Under Secretary also gives him responsibility for general R&D

policy and the Post Office, in addition to all matters concerning computers and the micro-electronics industries.

He succeeds Sir Geoffrey Pattie, who was knighted following his departure from the Department of Trade and Industry.



John Butcher

SOFTWARE HOTLINES
back next week

DIARY
DATES

JULY

10-12 July
Amstrad Computer Show

Alexandra Palace Pavilion,
London

Details: Displays and
demonstrations of all latest
hardware, software and
peripherals for Amstrad
computers

Price: £3 adult, £2 children, £1
discount for advance booking

Organiser: Database
Exhibitions,
061-456 8835

24-26 July
Acorn User Exhibition

Red Hall, Barbican Exhibition
Hall, London

Details: Latest hardware and
software plus seminars

Price: £2, advance, £3 on the
door

Organiser: Redwood
Publishing 01-836 2441 Ext.
275

SEPTEMBER

23-27 September
**Personal Computer World
Show**

Olympia, London

Details: Latest hardware,
software and peripherals for
business and leisure
computing

Price: £3, £2 - (parties over 10)
Organiser: Montbuild
01-486 1951

OCTOBER

15-17 October
Desktop Publishing Show

Business Design Centre,
London

Details: Demonstrations of
latest hardware and
peripherals, plus seminars and
user clinics

Price: On application
Organiser: Database
Exhibitions,
01-456 8838

Prices, dates and venues of
shows can vary, and you are
therefore strongly advised to
check with the show organiser
before attending. *Popular
Computing Weekly* cannot
accept responsibility for
any alterations to show
arrangements made by the
organiser.

Locoscript II puts PCW 8256 in doubt

LOCOMOTIVE Software has
made it clear that *Locoscript II*,
the new version of the word-
processor bundled with the
Amstrad PCW8256/8512, will
not be bundled with either
machine.

The announcement has
fuelled speculation that
Amstrad will be replacing the
8256 and 8512 with a revamped
PCW in the Autumn.

An Amstrad spokesman said
that *Locoscript I* will be bundled

with all PCW machines until or
unless any new machine is
announced.

Locoscript II - which was
launched last week - will be
distributed by Gem Distribution,
and will retail for £19.95.
Howard Fisher of Locomotive
chose his words carefully when
making the announcement
about the PCW.

"*Locoscript II* will not be
bundled with either the Am-
strad PCW 8256 or the 8512,"
he said, and added that he
"would not make any comment
about any machines that Am-
strad might launch in the
future."

So although the Gem deal
places doubt over any future
bundling of an Amstrad
machine with the new software,
it is virtually an open secret that
a new PCW is on its way.

Play your way to the top

EXECUTIVE computer games
could be on the way, following
the results of a survey which
shows that most US executives
use computers in their work-
place for games and personal
business.

Epyx quizzed 750 top business
people across the USA, and found
that 500 use their computer for
non-work related purposes. Of those,
57 per cent - 265 people - play computer
games.

Nearly three-quarters of

those questioned - 74 per cent
- write personal letters on office
equipment, while 33 per cent
balance their personal
finances.

However, 82 per cent of
those executives using the office
computer for their own purposes
stayed after work to do so.

It was all part of the Epyx
Executive Computer Survey,
designed to discover how executives
integrate computers into their working day.

Son of Thunderbolt

CODEMASTERS has announced
a number of new releases
following its recent retail
deals with WH Smith and Boots,
which will be stocking the company's titles
from this month onwards.

First of the new releases is a
Spectrum version of the best
selling Amstrad game *Grand
Prix Simulator*. This is due
about the end of July or the

beginning of August, and will be
followed by a C64 version three
weeks later. The company is
also working on ST and Amiga
versions.

The second new item is the
follow-up to *Thunderbolt: Lazer-
Force*, which features four different
shoot-'em-ups. This will be on the C64, and should
reach the shops by the end of July. Both games are £1.99.

Eidersoft HD surprise

A question mark is hanging over
Eidersoft's handling of hard
disc units, only a few weeks
after the company began distributing them.

"We're supplying the orders
we've got - the next 50 to 100

or so drives," said Eidersoft's
Clive Woods.

He claimed that Atari pricing
policy made Eidersoft's hard
disc operation uneconomic, and
a final decision would be taken
shortly.

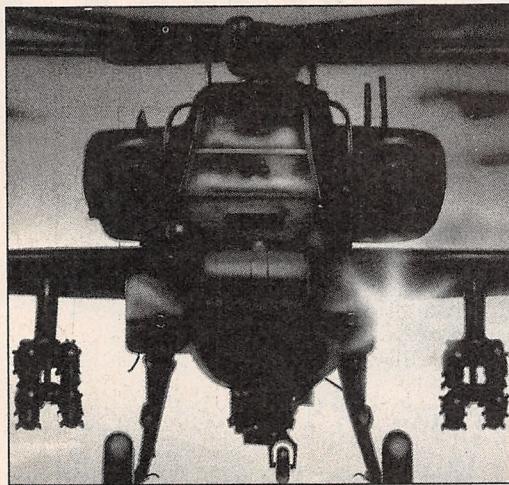
Sega on sale soon

THE SEGA machine is expect-
ed to go on sale in a number of
stores this month, although its
official launch is not until Sep-
tember's PCW show.

Mastertronic is currently
stock-testing the machine,
along with 12 dedicated soft-
ware titles, in selected
branches of Woolworth's.

Other stores which have al-
ready signed up to take the
machine are the Kids Store, the
Fine Fare and Gateway super-
market chains and Carrefour
hypermarkets.

"Other major multiples are
also keen on the machine; we're
adding new people almost
every day," said Mastertronic's
Rachel Davies. She confirmed
that the first machines, and
software, should appear in
stores in two weeks' time.



Microprose, the World's leading software simulation company and creators of F-15 Strike Eagle, Silent Service, and Gunship – 'the new and ultimate helicopter simulation'.



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Don't make your programs too long, please - it's best if we can print the full listing in one week, and a four part listing is probably the largest we can accept. If they're very short, then so much the better, they'll fit neatly into our Bytes and Pieces page.

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We're also particularly interested in articles about programming, which should be sent to Christina Erskine. If you think you could explain technical

areas of computing to a wider audience then do let us know.

We also welcome articles on any aspect of home computing, although we cannot feasibly accept anything longer than 2000 words. It's worth checking by phone or letter first that your piece will be suitable, but we're open to all ideas.

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Mark Jenkins welcomes correspondence of a musical nature for Soundcheck, Martin Bryant is interested in any queries or views regarding computer chess, and our communications correspondents will be happy to answer questions about modems and networks (mark your envelope 'Comms').

Any technical or programming problems you're encountering can be addressed to Kenn Garroch. Kenn tries to help as many people as possible in Peek and Poke, but cannot undertake to give personal replies.

How to submit

For features, it is almost always



better if you write or telephone first to discuss your ideas with us. Your articles should be typed or word processed, preferably in double spacing, using one side of the paper only.

Please don't write more than 2000 words for an article. Program notes should explain what your program achieves and how it works, but, again, please keep them concise.

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Your payment should arrive six weeks after publication date.

Where to send them

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We will make every attempt to acknowledge receipt of your submission.



RISC: THE NEXT MOVES FORWARD

ACORN'S recent launch of its RISC based micros could prove to be as important for sections of the microcomputer industry as IBM's Personal System/2 launch last April.

But that is not to say that Acorn will suddenly become the most profitable company in the world.

British companies almost by definition are first to launch usable forms of new technologies, and last to make the most of their potential. And it is the technology we are talking about here.

Archimedes - the range of machines based on ARM, the Acorn RISC Machine - is only the first RISC based micro. Clearly there will be more. What position will they occupy in the market? And what will Acorn's contribution be to the further development of Archimedes' successors?

It is worth restating the clear benefits from the use of RISC technology. First, RISC machines are simpler, and therefore easier to develop. Second, they are cheap to produce. Third, they are able to hold large amounts of memory.

Most importantly, fourth, they are very fast.

So while RISC has applications in the mainframe and mini markets of corporate and educational customers, it will be the specialist micro user who will be most attractive to those manufacturers, including Acorn, now working on the RISC units of the late 1980s/early 1990s. And it will be the micro applications of RISC that determine whether RISC manufacturers sink or swim.

Head of corporate research for parent company Olivetti - and Acorn's co-founder - Hermann Hauser explained how he sees RISC within the historical development of the micro.

"The change that comes will be similar to what happened in the aircraft industry," he said, comparing the advent of RISC units to the arrival of jet

engines.

"RISC machines suck the power from the memory and blow it out at a speed that is unrivalled."

He described IBM's recently launched Personal System/2 as "a beautiful example of the previous design of computer."

While such remarks are clearly no more than press launch speak, Hausers view evidently

to build RISC into their inventory.

Details are so far unclear, but Acorn's Brian Long stressed that he would like to see an increasing share of the market for ARM taken up by OEM customers "up to 30 per cent," he said at the launch.

"We are already talking to OEM customers in both existing and new market areas and the

of mounting software and writing new packages," says Long.

"The convergence of windowing systems and data standardisation will make program portability more easily achievable and we're therefore paying that area proper attention."

Acorn is also - in terms of RISC development - working towards the time, say in three or four years, when languages such as C and Modula-2 Plus become more widely used.

But just as RISC technology has an important position in linear terms of microprocessor development, so it is necessary to determine the position of RISC relative to other processor types in the real world of 1987.

Author, enthusiast and experienced industry observer Robin Bradbeer is one who takes a sanguine view of RISC, whilst admitting its future importance.

"I think there'll be a split between standard operating systems - MSDOS, and so on - and those manufacturers who go their own way."

"This is where people like Atari and Commodore have had some success, and you now see them providing downgrading packages for standard operating systems."

"As far as Acorn has got it at the moment, for the education market and very specialist users, CAD, etc, it is the way to go. In vertical, specialist areas - where you're using only one application - there will be a definite, but small market."

"But the large market will still be with standard operating systems, because of the ability to carry out data transfer."

So RISC manufacturers must successfully get over that problem of non-standard operating systems for machines such as Archimedes to ever become mass-market products.

Otherwise RISC based micros look set to have a marked effect, but only in a limited area. Acorn's recent past means it has to get it right.



Archimedes

represents the confidence both Acorn and Olivetti have placed in the project.

Acorn's past has been more than a little troubled, and since the takeover by Olivetti, RISC has consumed the lion's share of Olivetti's R&D investment. They must be expecting a pretty good return on their money.

So what next? The first result of last month's announcement is the chance for others to buy ARM as an OEM product. Other manufacturers then are aiming

depth of interest is very encouraging."

Long also claimed that Acorn researchers now have experimental RISC processors running at 18 mips - (millions of instructions per second) - Archimedes runs at 4 mips.

In addition to designing more powerful processors, Acorn is also working on advanced software.

"We're concentrating our effort on making systems easier to use and simplifying the task

FASTEAST RUN IN THE TEST

Tony Kindle reviews Micro-Peripheral's MP-480 printer and says it's the fastest printer for the money.

Over the last few years the capabilities of dot matrix printers have been gradually refined for decreasing cost, particular improvements being in print quality and print speed.

Print quality made a great leap with the introduction of two pass printing techniques which gave us near letter quality. More recently with the release of 24 pin printers, which use much finer dots than found on the traditional 9 pin machines, true letter quality output is beginning to look affordable. We probably still have not seen the best that the machines are capable of.

However, until now, significant increases in print speed looked to be unlikely without changing to a solid state system such as a laser printer. The sheer mechanics of moving a head backwards and forwards are finitely capable of improvement without a fundamentally different approach, which is exactly what the Micro Peripherals' MP-480 has used to produce what must be the fastest machine for the money you will see for a long time to come.

Like all good ideas the technique used is absurdly simple. The machine has no less than four print heads, spaced about an inch and a half apart on one giant bar. Each head therefore only has to do a quarter of the work to produce a line of text. With all four going at once it is no surprise that you get the amazing figures of 480 characters per second in draft mode, and 80 cps in NLQ.

Graphics and screen dumps are DTP packages such as Polyprint or AMX Page-maker as these print all of their 'text' in graphics mode.

The design is like a hybrid between line printers, which have one large head that spans the entire width of the page but only print one row of dots at a time, and the more common moving head type that print eight dots vertically at a time. The speed of line printing is thus merged with the flexible head positioning required to produce high density graphics.

This technique promises greater scope for increased speed on a wide carriage printer. There can be even more heads for a start, and a reduction in the percentage effect of time spent on line feeds which are amongst the slowest jobs a printer does. The promised MP-700, a six head wide carriage machine, is advertised to be capable of 720 cps in draft and 120 cps in NLQ, although no prices are yet available.

To put this in perspective, in NLQ mode it is as fast as say the PCW printer or the DMP 2000 is in draft. (But of course on eight inch wide paper you will get comparable performance from the MP-700 as with the MP-480.)

The question immediately springs to mind; with more heads doesn't it make for just more things to go wrong? Well, yes and no. For a given page of print each head will have done a quarter of the work and so the whole complex should last for four times as long as a single head machine.

On the other hand I am going to hazard a guess that to make the machines as competitively priced as they are, the actual heads used are of a comparatively cheap type; the accompanying technical sheet does not rate their individual life as high as

most of the more recent single head machines Micro Peripherals has produced.

Aside from its exceptional speed, the MP-480 is still a very respectable piece of hardware.

Like the printer, the manual is a remarkable hybrid but the news is not all good. Its depth of technical detail is excellent with every option and control code, and their effects, covered in full, and hardware details adequate for a maintenance engineer.

Unfortunately the clarity of the explanations is wrecked by the awful 'Japlish' in which it is written. It was a brave attempt by the translator, but badly needs re-editing to make the essential information clearer for those who have not used printers before, particularly with so much frightening looking technical detail mixed in.

Congratulations however to Micro-Peripherals for the standard of its information sheets which summarise a lot of the useful information a potential buyer needs to know such as noise and ribbon life. I would like to see a section on which typefaces can be mixed with which, but on the whole these handouts are better than any I have seen from other makers.

The review machine forwarded had an early version of the Rom that controls the printer fonts, and the characters formed lack true descenders on letters such as 'g'. The following comments have therefore been inevitably based on the fonts we have seen, as are the printout samples. However, Micro-Peripherals assures me that the printer going on sale will have a much improved set of fonts, descenders and all.

The NLQ is really quite reasonable, far from the worst that I have seen if not exactly state of the art. With a new ribbon it is bold, crisp and very legible. NLQ can be mixed with italic and enlarged styles, and, of course, underlined.

Given that it is not intended for quality presentation, the draft mode is extremely good as it retains many of the strong points of the NLQ option - a chunky but extremely clear and easy to read output. All of the standard IBM/Epson style permutations are possible - pica, elite, bold, condensed and even condensed-elite.

The choice between Epson and IBM control code compatibility is both software selectable and can be set by dip switch settings. The dip switches themselves are situated on the top of the machine, behind a

This is the Near Letter Quality Text

This is Italic NLQ

This is Enlarged NLQ

This is normal text

Bold normal

Condensed

Condensed Elite

small protective panel and all are large, well spaced, easily accessible, clearly numbered and all in all of a model design.

There are also some optional control codes that seem to be unique to these machines, such as settings which will automatically centre, left justify, right justify or full justify any line of text that they are sent.

An 8K buffer is optionally expandable to 32K to speed up the process of returning control to your micro even more. In the supplied machine only 4K acts as a buffer, the remainder is allocated for storing downloadable user defined characters but can be reclaimed if required. 110 draft characters and six NLQ characters can be defined (although this is one of the areas where the manual explanation really begins to strain tolerance).

The front panel options are excellent. There is a draft and a NLQ test mode, a NLQ button and status light for printing top copies without having to re-edit the text, a hex dump mode for diagnosing the output from a program you are running, and also the ability to step through any print style by using different combinations of the on line, line feed and form feed buttons - ideal for use with unfriendly programs which give you no control over the style of output.

The ribbon is the now obligatory cartridge type which looks very much like that used on the Amstrad PCW but is inevitably different. Its lifespan is claimed to be one million draft characters which I must confess I have not tested, but would be

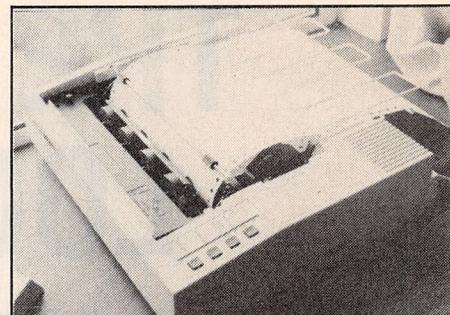
admirable if true, as most peg out long before this.

The machines can be supplied with both parallel and serial interfaces and so will work with almost any microcomputer. These different interfaces are interchangeable, a simple process with a screwdriver, so that changing your micro will not mean abandoning your printer.

The MP-480 is an amazingly compact machine, and the cover is well muffled by sponge rubber (the noise incidentally is like no other I have heard - more wheezy and less harsh than most dot printers) so in all the machine is not too much of a nuisance to have on your desk. The design of the machine is such that tractor paper is pushed through rather than pulled by the tractor sprockets. This is designed to ensure that the typical paper wastage that is associated with tractor feeds can be kept to a minimum.

However, I found it slightly cumbersome to load with paper, although that is probably just a matter of practice. More seriously with the noise cover in place the paper tended to jam up which, considering the speed the paper is fed in, is no joke, and I quickly realised it was best to leave it off. Nor was I particularly impressed by the wire paper guiding rack which was flimsy and easily knocked out of place. Not a machine that I would like to leave unattended for even a minute, but then very few are.

To be honest though, if you need a high speed printer these drawbacks are trivial.



Everyone who has seen the MP-480 chugging out page after page of print has been staggered by its output. The way that whole lines of text appear before your eyes is just incomparable for the price.

Computers are expensive, in most offices people's time is even more valuable, yet you repeatedly see situations where all work stops whilst the printer leisurely cranks out hard copy. The MP-480 would represent an instant saving in such situations. I also understand Micro-Peripherals is bringing out a 24 pin letter quality version, which means that dot matrix machines could really give laser printers a run for their money ...

Product MP-480 **Micro** Almost any (serial or parallel interfaces available) **Price:** £424.35 (£369 + VAT) **Supplier:** Micro Peripherals, Intec 2, Wade Road, Basingstoke, Hampshire RG24 0NE.

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THE ARRIVAL OF LOCOSCRIPT 2

Locoscript 2 may have taken a long time to arrive, but it is now finally ready. Christina Erskine rings in the changes.

Locoscript 2 has been a long time coming. First mooted about a year ago, announced as more or less ready a couple of months back, the minor refurbishments and polishing took longer than anyone at Locomotive Software expected. Finally, however, it's finished and available.

To set *Locoscript 1*'s users' minds at rest to start with: you will not have to relearn the program from scratch – it's not drastically different, and your *Locoscript 1* documents will convert to *Locoscript 2* documents virtually automatically.

There are three main differences in version two. Firstly, speed (you can move more quickly around documents). Secondly, the number of special characters that can be produced has more than trebled – there are about 300 'hidden' characters, from mathematical symbols to Cyrillic and Greek character sets on *Loco 2*.

Thirdly, the 'ease of use' changes.

Nearly all the menus, and their access codes, have changed. Locomotive says these have all been implemented to improve your chances of getting the most out of *Locoscript*, and making its facilities clearer.

At the moment, being used to the old format, I can see the sense of some, and not necessarily of others. It's all going to depend on which features you found particularly useful – or irksome.

Menu changes

This is where new users are going to get their hands in a twist to start with.

From the disc management screen, reading from the top, things are normal until you come to the menus themselves which have nearly all been changed.

f1=Actions 'Disc Change' has moved to f7; the new f1 is now concerned with making Ascii files, and inspecting your collection of phrases and blocks.

f2=Disc This is a distinct improvement. Here are options to copy, verify and format your discs, which means – three cheers – that you no longer have to go into CP/M and *Diskit* to do so. Renaming the disc is also in here.

f3=File Rather than splitting the 'copy', 'move', 'rename' and 'erase' file functions into two separate menu headings, these are all contained as options under f3. Recover-

window throws up more information than 'inspect document' on *Loco 1*, although, to be honest, I've never found it much help, when trying to work out which document is which quickly.

f6=Settings Options pertaining to paper and printer being used. See below, under Paper and Printer settings, for more information; this menu contains features quite different from those in the original.

f7=Disc Change As f1=Disc Change on *Loco 1*.

f8=Options No change; still gives choice of whether to show Limbo and Hidden files or not.

On the editing screen, you'll notice an extra feature, CR+O on line two. This enables you to leave a particular line space after a carriage return, ie, between paragraphs. It can be set at zero (which is the default), a half, single, or one and a half line space. Other than that, the menu changes are largely a matter of re-ordering:

f1=Actions The new Actions menu comprises parts of the old f7. One unfamiliar option, Document Setup, is simply Edit Header under another name.

f2=Layout The layout menu has been clarified considerably. You're now given 'New Layout' and 'Change Layout' options, rather than the superfluously named 'Brand New Layout', and Edit Layout???. Here also are the centring, realignment and justification features.

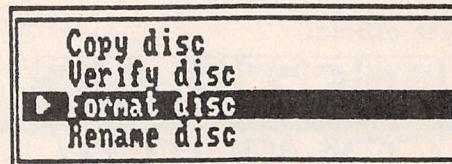
f3=Style This is the menu where you can move the cursor over choices of underline, word underline (won't underline spaces between words), bold, double strike, italics, superscript, subscript and reverse video (now simply called reverse).

Of course, you can still access these by pressing the + key and waiting for the menu (see Character style menus, below), or by pressing + and then the key letters, eg, + then B for bold, UL for underline, etc.

f4=Size A completely different format for character pitch, width, line spacing, line pitch, etc.

The choices of pitch, size, etc, are now displayed horizontally across menu bars. Move left/right cursor to highlight the one you want, press + to confirm. It's more orderly than on the original *Locoscript*, but I'm not convinced it's substantially quicker or easier.

Pitch and spacing can still be set for an entire document at layout stage, but using



Locoscript 2's disc management screen: things are normal until line two

SOFTWARE: REVIEW

this menu again, not the Line pitch, spacing, menu at the top of the screen as in the original *Locoscript*.

Character pitch 12
 10 ✓12 15 17 PS
 ✓ Normal width
 Double width

Line spacing 1
 0 1/2 ✓1 1 1/2 2 2 1/2 3

CR extra spacing 0
 ✓ 0 1/2 1 1 1/2

Line pitch 6
 5 ✓ 6 7 1/2 8

f5-Page One of *Locoscript 2*'s strongest features compared to its predecessor is the ability to jump to any page in the document, and this is where you implement it. The End Page Here, and instructions for keeping certain lines together on a page are also in this menu.

f7=Spell (NB There isn't an f6) Throws up *Locospell*, if you have the program inserted in your machine. *Locospell* does not come as an integral part of *Locoscript 2* (nor does *Locomail*, and new versions of both must be bought, or upgrades obtained from *Locomotive*). This is a pity.

f8=Options The old f1, suggesting you might like to see on screen the rulers, codes, blanks and spaces you have effected.

Show state of:

Codes

Rulers

Blanks

Spaces

✓ → H U T symbols

Paper setting

Locoscript 2 is much cleverer than *Locoscript 1* in that it will hazard a pretty good guess as to what kind of paper you are using, and what depth of lines to a page you need.

Thus, if you're using A4 or A5 single sheet, or 11 continuous (standard computer stationery) paper, you can select that from the menu thrown up by 'paper types' on the f6 menu, and the program will automatically

work out page lengths, header and footer zones for you.

Paper Type

✓ A4
 A5
 11continuous

✓ Portrait (Tall)
 Landscape (Wide)

► Use Paper Type
 Show Paper Type

If you're using something weird, you still get the chance to set up the page lengths accordingly, and *Locoscript* should remember them.

Paper: AS

✓ Single sheet
 Continuous stationery

Height 50
 Width 35

Top gap 6
 Bottom gap 3

✓ Ignore paper sensor

► Use Paper Type

Printer setting

Locoscript 2 is compatible with not only the Amstrad PCW printer, but Epson FX-80 and Diablo 630 and any compatible with those two as well. The f6=Settings menu from the disc management screen and f5=Printer menu from the printer control screen enable you to select these printer types to use.

Printer Selection

Character Style
 Standard PS
 Character Set
 Standard

► Printer
 MATRIX

EXIT

A word of warning: the extra characters supplied with *Locoscript 2* are designed for use with the PCW printer – you may not get all of them on a different printer.

In addition to specifying the printer you have connected, you need also to explain to *Locoscript 2* its character set, again through the menus named above.

Printer Defaults

Defaults for Printer
 D630

Default Paper Type
 A4

Default Style
 PrestigePica 10

Default Set
 England

Printer Options

EXIT

If you use a quite different printer, it's back to the dealer (so suggests the *User Guide*) to have printer files made up, which you can add to your start of day disc. I haven't tried this procedure myself; but it sounds suspiciously like a 'fire in theory' task.

Printer

✓ MATRIX
 D630
 FX80

Character style menus

Some small changes have been made to the long menu of styles (bold, underlined, etc) you get by pressing +.

Most seasoned *Locoscript* users will by now, surely, be pressing + followed by 'key' letters – those printed in capitals on the menu itself, so before they become startled by the ineffectuality of some well used codes, a brief guide.

C is no longer good enough on its own for centring a line. It now has to be CE, to make room for CR, the new feature which gives you the option to add extra lines or half lines between paragraphs.

Justification has also been tidied up. A simple J will now give you justified text (even margins down both the left and right hand sides of your document), while RA stands for Right Align, and send the next

continued on page 16 ►

SOFTWARE: REVIEW

◀ continued from page 15

piece of copy to stand flush against the right hand margin (instead of RJ - right justify).

Also, the menu is now that much longer, so if you do use it, you'll find it now scrolls downwards to fit all the features in.

Speed

Locoscript 2 is quicker to use because the procedure needed to move from place to place within text, or into a particular line in a document has been made easier, rather than through some magical form of disc access. That having been said, moving through a document with the cursor keys, or inserting 'pasted' text is carried out considerably more quickly.

The biggest single contribution to *Locoscript 2*'s faster operation is that when editing a document, you can jump to the page that you want, rather than always having to go to the top of the document.

If you use Save and Continue to back up your work regularly, this too will now return you to your current position in the document, not back to the top.

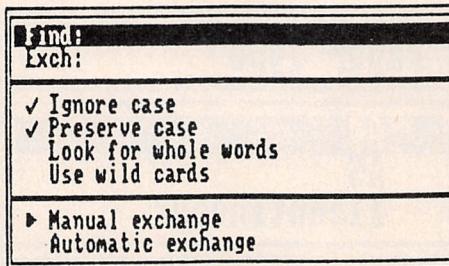
Also, when exiting from editing the header (document setup), you can choose whether to return to the point where you had finished editing, or the start of the document, instead of, again, always the beginning.

Incidentally, the Exit menu of confirming header (setup) alterations, emptying the text, new text, etc, has gone. You can remove the headers and footers from f1=Actions, but other major alterations must now be done manually.

There is now more information on screen when you are going into a long document or finishing editing. A 'window' will come up, centre screen, to tell you how *Loco 2* is getting on with processing/accessing each page as it goes through. A centre window also appears when you are carrying out cut and paste functions.

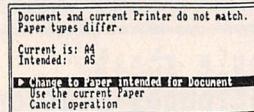
The Find/Exch feature has also been improved, in that you no longer have to type in the word or phrase you wish to find precisely as written in the text; you can mix

capitals with lower case letters, and there is a 'wild card' feature.



For example, say, that in your document, you've used both the words 'inquire' and 'enquire', sometimes at the start of a sentence, and you want to standardise the spelling throughout the document. Press the Find/Exch key, activate (by pressing +) the Ignore Case (so that it will recognise both *Inquire* and *Enquire* as well) and Use Wild Card options and type ?nquire. The query stands for the variable letter.

Locoscript 2 will then search and stop the cursor on the first instance of inquire/enquire. Use Find Next from the Find/Exch menu to access all the instances.



Conclusion

Locoscript 2 promises to be excellent for PCW users who are largely happy with *Locoscript*, but find some of its features unwieldy to manipulate quickly and easily.

Anyone less content with Locomotive's word processor should remember that it is by no means a new program; it is still *Locoscript*, smoothed out and made more accessible.

It's still incompatible with many other word processors, although of course, the Make Ascii File function has been retained. It's still largely menu, rather than keyboard command, driven, although preferences here are really a matter of taste.

It will set you back £19.95 - it's not a free upgrade - but owners of *Loco 1*'s *Locospell* and *Locomail* will be able to upgrade those to version two free of charge. Owners of 8256s with an unexpanded memory should beware, however, *Loco 2* takes up more space and you may well not get the spell checker and mail merge programs to fit into memory.

Lastly, potential buyers will be pleased to hear that the User Guide is much improved. It caters for both newcomers to the program, and old *Locoscript* hands, with a first chapter outlining the major differences between the two programs, and a useful quick reference guide to functions at the end.

Locoscript 2: major changes

Editing

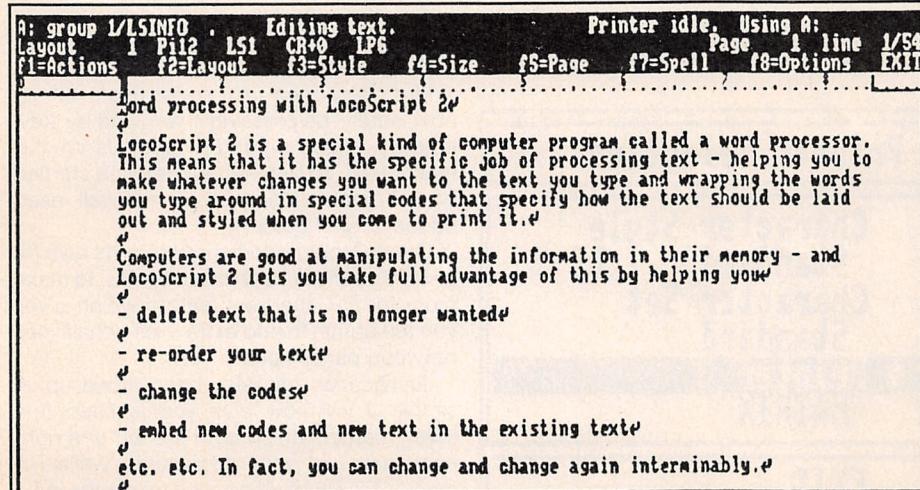
- Reorganisation of most menus (see text)
- Can now copy or format new discs from within *Locoscript 2*
- Go to any page when editing document
- Return to start or end of document after editing header
- Return to foot of document after Save and Continue
- Information message appears in screen when editing, saving, etc
- Can select your own first page number, and number consecutively thereafter
- Creating layout procedure simplified
- Header and footer zones (document setup) automatically calculated on standard paper sizes

Text

- Nearly 300 extra special characters including full Greek and Cyrillic alphabets - can combine any accent with any letter
- More flexible Find/Exch function - includes 'wild card' feature
- More permutations of line pitch, spacing, spacing between paragraphs, etc, available
- Easier saving of text blocks - no need to save separately if you want to use a particular block in another document
- Information window appears in screen when cutting, pasting, etc

Printing

- Semi-automatic page sizing for paper types
- Can print multiple copies of documents
- Compatible with Epson FX-80 and Diablo 630 printers
- Select high or draft quality from Print Document or Save and Print menu, not from Printer control screen



The editing screen on Locoscript 2

YOUR INVITATION

VENUE:
DATE/TIME:
METHOD
OF ENTRY:
ID NUMBER:
PASSWORD:

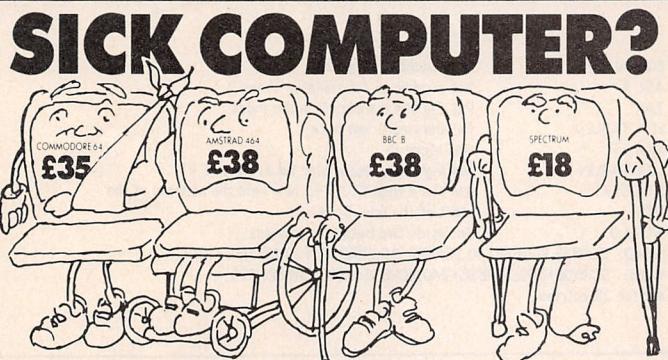
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"COMING, SOON"

Tricks and tips for machine code programmers

Kenn Garroch concludes his series on machine code programming with a look at the multiplication, division and lookup tables that make life easier for the first-time programmer.

There are various tricks and tips that are always of use to anyone who is using machine code for the first time. Many of these are machine specific but there are some that are useful on any processor. Multiplication, division, and lookup table are some of the most.

Virtually any function can be performed using a lookup table. The only drawback is that it takes up space which is sometimes at a premium. A table is simply a set of precalculated numbers stored sequentially in memory. Accessing the table depends on what it is being used for, but in general, indexed addressing is used.

Indexing is where an index register is used as an offset for a load or store, eg,

LDX #10
LDA TABLE,X

Thus, in 6502, loads the accumulator with the 11th byte after the address specified by TABLE. The first byte is when X holds zero and is the actual address defined by the label TABLE. Quick multiplications can be performed using this method. As an example, take the screen Ram which starts at an address SCRBSE and has 25 rows of 40 characters. To find the address of the start of a line, the formula address=SCRBSE+(40*line) is used. A times 40 table can be constructed, ie, 0, 40, 80, 120, 160, 200, 240, 280, etc, for 25 numbers.

The first thing to notice about this is that some of the values are greater than 255 but less than 65535 so two byte results need to be stored in the table. To multiply the line number by 40, get the line number, shift it left one place to multiply by two and then put this result in the index register. Use this offset to get two bytes from the table.

These are the high and low bytes of the line number times 40 and can then have the SCRBSE value added to them to give the absolute address of the start of the line.

In binary, shifting numbers left and right is the same as multiplying and dividing by 2, eg,

00110111=37hex 55dec

←01101110=6Ehex 110dec binary number shifted left one place

→00011011=1Bhex 27dec binary number shifted right one place

plus carry set to one.

Since the lookup table consists of 16 bit numbers as double bytes, the index has to be double. The first result, ie, 40*0 occupies

bytes 0 and 1, the second, 40*1 is in 2 and 3 of the table. Therefore when the index is two, it points to the first byte of the second entry. .

Having obtained the result of the multiplication, the screen base address is added which requires extra work on the part of the processor.

Looking at the table from another point of view, it can be seen as a series of addresses and as such, might as well have the screen base address included in each entry. If SCRBSE is 49152, the table is now: 49152, 49192, 49232, etc, all of which are 16-bit numbers and save the extra work of adding in the base address at a later time. The lookup program is shown below.

ways for sines and cosines or anything that is difficult to work out but is a regular result. The main thing to remember is that although lookup table are usually the fastest method, they can take up a lot of space.

Multiplication and division can also be performed the long way round although on the 68000, specific instructions are included that to the work for you; ie the instruction set includes MUL and DIV. On smaller processors, these two operations have to be done the hard way.

Multiplication is done with the shift add method which is effectively the same as long multiplication as done by hand. Take two numbers: 5 and 9, which in binary are 0101 and 1001. To multiply them:

; 6502 version		
SCRBSE	EQU 49152	;base address of screen
LOOKUP	ASL A	;line number in accumulator times 2
	TAX	;Put the line number *2 in the index
	LDA TABLE,X	;Get the result low byte
ST	STA ST	;And store it
TABLE	LDA TABLE+1,X	;Get high byte, assembler takes care of +1
	STA ST+1	;and store this. ST/ST+1 now hold the address of the
	RTS	;start of the line. So return.
ST	WORD 0	;Set aside two bytes for address
TABLE	WORD SCRBSE,SCRBSE+40,SCRBSE+80,SCRBSE+120,SCRBSE+160	
	WORD SCRBSE+200,SCRBSE+240,SCRBSE+280,SCRBSE+320	
	etc for 25 entries	

; Z80 version		
LOOKUP	SLA L	;Line number in L reg times 2
	LD H,0	;Zero the H register
	LD IX, TABLE	;TABLE address into index reg
	ADD IX,HL	;Add the TABLE offset
	LD H,(IX+0)	;Get high byte to H
	LD L,(IX+1)	;Get low byte to L
	RET	;result in HL

TABLE is the same as the 6502 version

; 68000 version		
LOOKUP	ASL.W #2,DO	;Line number in DO lowest WORD *4
	MOVE.L #TABLE,A0	;Get value of TABLE i.e. the address to A0
	MOVE.L 0(A0,DO),A1	;Address is now in A1
TABLE	RTS	
	DL SCRBSE,SCRBSE+40 etc	;Each entry is 4 bytes long since addresses are 24
		bits

The examples of lookup show the differing capabilities of the processors. The 68000 version is the most efficient but then, it is far more powerful than either the 6502 or the Z80.

Lookup tables can be used in similar

1001 9
0101 times 8

1001 take left hand digit of 8 (1) times 9 is 9
00000 next digit is zero and result shifted left 1
100100 next digit is 1 so shifted again
0000000 last is zero hence zero

0101101 add all the results to get 45

PROGRAMMING: FEATURE

As each successive digit of the 8 is used, the result is moved left one place, putting a zero on the right hand side. As a machine

code program this is as shown in the first program below.

Division, again, is performed in the same

way as long division is done by hand. A Z80 program to do it is shown below.

MUL	LDA #0	;Zero the result M
	STA M	;and the high byte of B
	STA M+1	;the number to be shifted
LOOP	STA B+1	
	LSR S	;check for least sig bit =1
	BCS ADD1	;if so then add B into result
LOOP1	LDA #0	;check whether the multiplier is zero
	CMP S	
	BEQ FIN	;if so then all done
	ASL B	;otherwise shift B left one bit
	ROL B+1	;two bytes needed to ROL moves any carryout into B+1
	JMP LOOP	;do next bit

ADD1	LDA B	;Add B and B+1 into the result M and M+1
	CLC	;since 6502 only has ADC clear the carry flag
	ADC M	;Add B and M
	STA M	;and put result in M
	LDA B+1	;Add high bytes plus carry
	ADC M+1	;to M+1
	STA M+1	;and store there
	JMP LOOP1	;do next
FIN	RTS	;finished
	B BYTE 20,0	;One number to be multiplied in B low
	S BYTE 10	;other in S
	M WORD 0	;result in M and M+1 low high respectively.

DIV	LD HL,(DVE)	;Get dividend
	LD A,(DVR)	;Get divisor
	LD C,A	
	LD B,8	;Count equals number of bits in divisor
DDIV	ADD HL,HL	;Same as shift left i.e. times 2
	LD A,H	;Can divisor be subtracted?
	SUB C	
	JR C,CNT	;No do next
	LD H,A	;Yes subtract divisor from dividend
	INC L	;Add one to quotient
CNT	DJNZ DDIV	;Decrement B and jump to DDIV if non-zero
	LD (RES),HL	;Put result into memory
	RET	;All done
DVE	BYTE 0,0	;Dividend goes in here
DVR	BYTE 0	;Divisor here
RES	BYTE 0,0	;Result here quotient low and remainder high

Ends.

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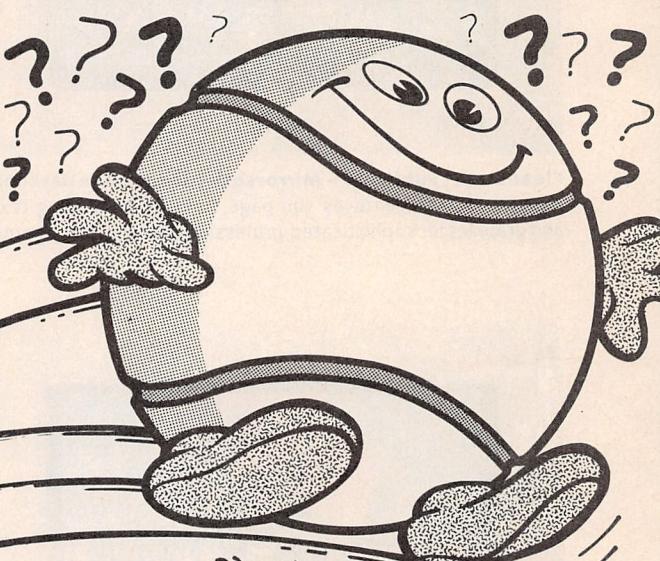
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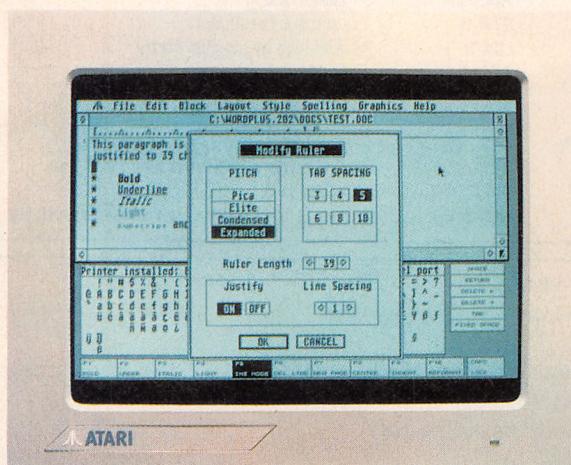
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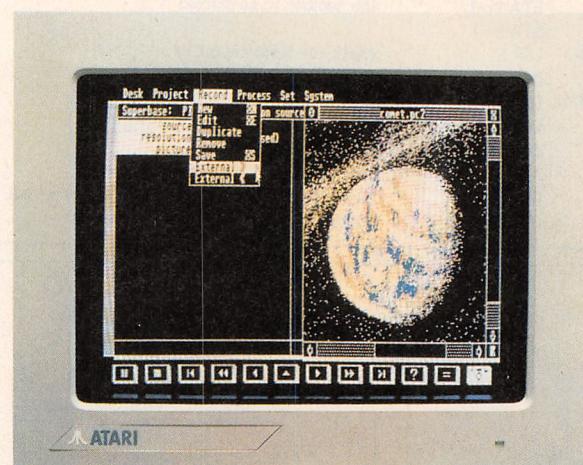


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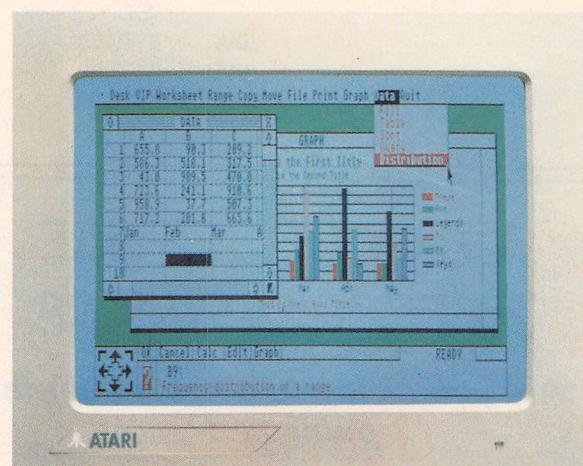
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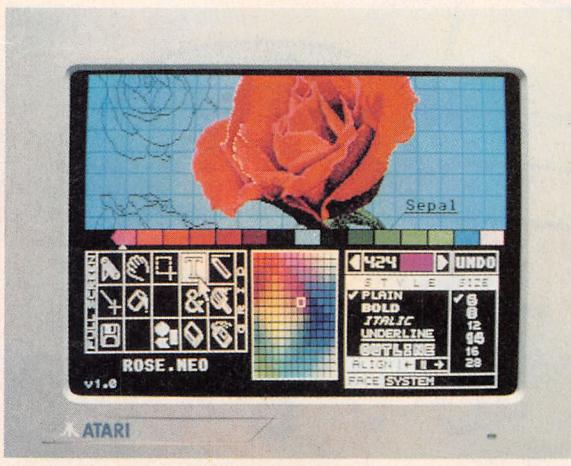
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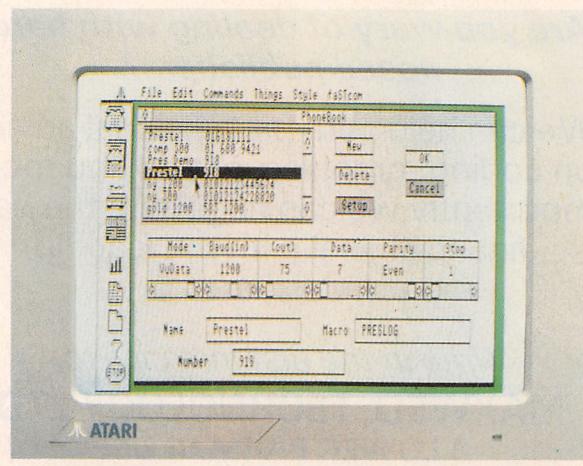
Fleet Street Publisher – Mirrorsoft. The complete desk-top publishing package. Gives you page make-up combining text and graphics for sophisticated, professional looking documents.



VIP GEM – Silica Distribution. VIP Professional is an integrated spreadsheet, database, and graphics package. GEM environment plus Lotus 1-2-3 compatibility.



Neochrome – Atari. A powerful, sophisticated painting program for unsurpassed graphics. Work boldly on full screen canvas or in minute detail using Neochrome's magnifier.

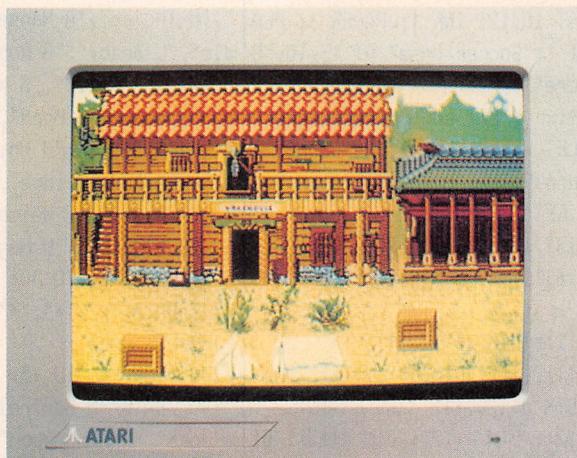


Fastcom – Atari. A professional communications software package giving access to most major databases worldwide. (Integrated ASCII/Viewdata package).

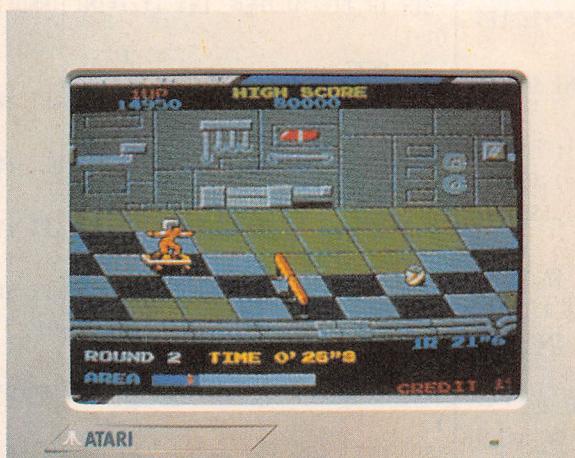
These other fiends may be a bit trickier.



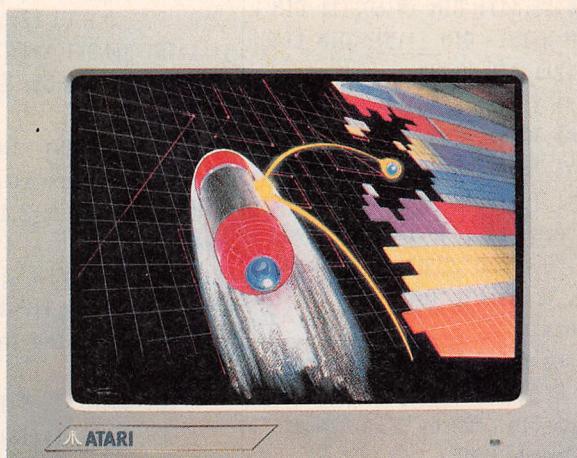
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ATARI 520 ST
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Soccer Boss

Andrew Oldacre

```

11 PRINT AT 10,12; INK 1; PAPER 6; FLA
SH 1; BRIGHT 1;"Soccer Boss" AT 13,10;"B
y..A J Oldacre"
16 LET cpfix=0: LET ecg=0: LET elg=0:
LET aga=0: LET agh=0: LET round=0: LET 1
eg=0: LET euro=0: LET cpin=0: LET nn=0:
LET lgin=0: LET loan=0
17 DIM z$(34,11): DIM r(12)
18 DIM g$(6,11): DIM h$(6,11): DIM d(6
): DIM k(6)
19 DIM m(12): DIM x$(12,11)
20 DIM a$(12,11): DIM b$(12,11): DIM
c$(12,11): DIM d$(20,11)
30 DIM p(12): DIM w(12): DIM d(12): DI
M o(12): DIM a(12): DIM t$(16,11): DIM q
(12): DIM y(12): DIM z(12): DIM s(12): D
IM t(12): DIM b(12)
40 DIM 1$(16,2): DIM f$(40,11): DIM p$
(41,11): DIM v$(82,11): DIM f(34): DIM h
(34): DIM s$(15,11): DIM i$(60,1): DIM k
$(16,1): DIM g(15): DIM j(15): DIM l(40)
49 DIM c(12): DIM i(48)
50 FOR x=1 TO 12: READ a$(x): NEXT x
60 FOR x=1 TO 12: READ b$(x): NEXT x
70 FOR x=1 TO 12: READ c$(x): NEXT x
80 FOR x=1 TO 12: READ d$(x): NEXT x
90 DATA "Arsenal", "A Villa", "Coventry
", "Chelsea", "Everton", "Luton", "Liverpool
", "Man Utd", "Norwich", "Tottenham", "N For
est", "West Ham"
100 DATA "Watford", "Sheff Wed", "Southa
mpton", "Q P R", "Oxford", "Wimbledon", "Cha
rlton", "Newcastle", "Derby", "Portsmouth",
"Man City", "Leeds Utd"
110 DATA "Oldham", "Stoke", "Plymouth", "C
Palace", "Brighton", "Reading", "Grimsby"
, "West Brom", "Birmingham", "Sheff Utd", "M
illwall", "Middlesbro"
120 DATA "Notts Co", "Swindon", "Bristol
C", "Bristol R", "Bolton", "Blackpool", "So
uthend", "Walsall", "York City", "Fulham", "W
olves", "Swansea"
121 LET t$(3)="Coventry": LET t$(4)="Ev
erton"
130 FOR x=1 TO 12: LET v$(x)=a$(x): LE
T v$(x+12)=b$(x): LET v$(x+24)=c$(x): LE
T v$(x+36)=d$(x): NEXT x
140 FOR x=49 TO 60: READ v$(x): NEXT x
150 DATA "FC Hamburg", "AC Milan", "Inte
r Milan", "Roma", "Juventus", "Sampdoria", "A
scoli", "Ajax", "Barcelona", "Real Madrid"
, "Napoli", "FC Porto"
160 FOR x=1 TO 35: READ p$(x): NEXT x
170 DATA "P Shilton", "G Stevens", "K San
som", "V Anderson", "K Ratcliffe", "R Bough

```

Recovered from the election yet? No? Well, here's something to take your mind off it, not the least because it's going to take four weeks to type it all in.

Soccer Boss features four divisions, FA Cup, European competitions, transfers, four skill levels, money problems, player skills, match tactics and commentary. Go to it.

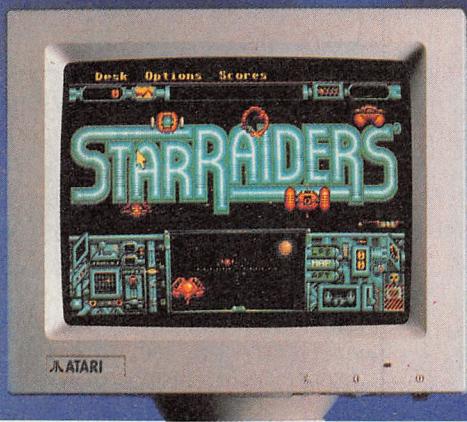
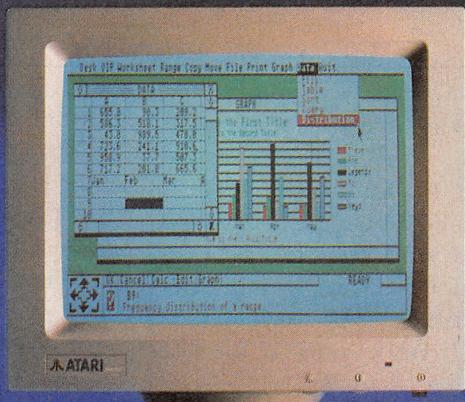
```

", "M Thomas", "A Hansen", "T Adams", "G Hod
dle", "L Brady", "B Robson", "J Molby", "S H
odge", "C Waddle", "S Williams", "P Davis",
"A Oldacre", "S Mead", "S Patterson", "M Pi
tts", "A Davis", "N Whiteside", "C Allen",
"J Rush", "J Aldridge", "J Olsen", "D Oldacr
e", "K Riste", "P Walsh", "G Sharp", "A Heat
h", "G Lineker", "M Hughes", "T Cottee"
171 FOR x=36 TO 40: READ p$(x): NEXT x
172 DATA "*", "*", "*", "*", "*"
173 LET con=1
180 FOR x=1 TO 15: READ s$(x): NEXT x
190 DATA "N Southell", "R Stewart", "S W
alford", "M Lawrenson", "T Butcher", "J War
k", "P Allen", "P Reid", "D Phillips", "C Ni
cholas", "N Quinn", "M Harford", "*", "*",
*
200 FOR x=1 TO 35: LET f$(x)=v$(INT (RN
D*60)+1): NEXT x
210 FOR x=1 TO 12: LET k$(x)="f": LET
j(x)=INT (RND*10)+1: NEXT x
220 FOR x=1 TO 35: LET l(x)=INT (RND*10
)+1: NEXT x
250 CLS : PRINT INK 2; AT 1,1;"Footbal
l League Division Four": FOR x=1 TO 12:
PRINT INK 1; AT x+2,10;x; AT x+2,13;d$(x)
: NEXT x
260 PRINT PAPER 0; INK 7; AT 16,1;"Ple
ase select your first team"; AT 17,1;"to
manage, input the team no.": INPUT 1$(16)
270 IF 1$(16)=" " THEN GO TO 260
271 LET n=VAL 1$(16): IF n>12 OR n<1 TH
EN GO TO 240
280 LET y$=d$(n): LET mon=35000: LET mo
r=45: LET sq=12
281 CLS : PRINT PAPER 1; INK 6; INVERS
E 1; AT 0,10;"Skill Level": PRINT INK 2;
AT 4,2;"Input your manager skill level"
282 PRINT : PRINT " 1. Amateur Managem
ent" " 2. Average Management" " 3. E
xperienced Management" " 4. Profession
al Management": INPUT " Select Level 1-
4": INPUT 1$(16): LET n=VAL 1$(16)
283 IF n>4 OR n<1 THEN GO TO 281
284 LET ski=n
290 LET round=0: LET leg=0: LET loan=0:
LET smf=0: POKE 23609,50: REM start of
season
291 FOR x=1 TO 15: IF j(x)>0 THEN LET
k$(x)="f"
292 LET g(x)=0
293 NEXT x
294 LET pick=0: LET sel=0: LET buy=0
299 FOR x=1 TO 60: LET i$(x)="i": NEXT x

```

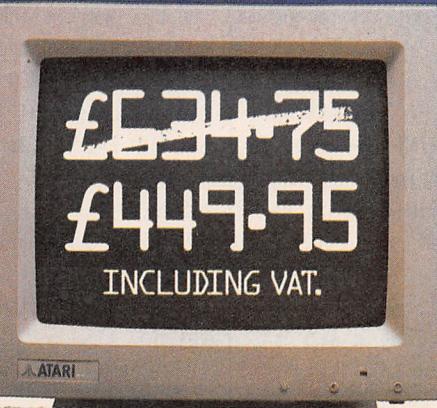
continued on page 24 ►

To help you defeat
the taxman



and destroy the
aliens,

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For a limited period, the Atari 520 STM is even more of a knockout than usual.

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WORKS HARD • PLAYS HARD

*Offer includes mono monitor. The 520STM plugs into a standard colour TV.

PROGRAMMING: SPECTRUM

<pre> h ***": IF i\$(crd)="o" OR v\$(crd)=y\$ THEN GO TO 408 409 IF u\$="i" AND match=0 AND gmc=19 THEN LET cpfix=INT (RND*2): LET crd=INT (RND*24)+1: LET m\$=v\$(crd): LET j\$="* FA Cup Semi Final *": LET smf=crd: IF i\$(crd)="o" OR v\$(crd)=y\$ THEN GO TO 409 410 BORDER 7: PAPER 7: INK 2: CLS : LET match=0 412 IF gm=1 AND rf=1 THEN GO TO 420 413 IF fix=0 AND j\$="Football league match" THEN LET fix=1: GO TO 420 414 IF fix=1 AND j\$="Football league match" THEN LET fix=0 420 PRINT PAPER 3; INK 7; AT 2,8;"Club Statistics" 430 PRINT AT 4,8;"Club ";y\$ 440 PRINT AT 6,8;"Division ";dv":AT 8,8;"Club funds #";mon":AT 10,8;"Squad content";sq":AT 12,8;"Match V ";m\$":AT 14,8;j\$ 441 BEEP .02,44 448 PRINT AT 18,8; INK 1; PAPER 5;"Press any key" 449 IF cpfix=0 AND j\$<>"Football league match" THEN PRINT AT 16,8;"Home Draw" 450 IF cpfix=1 AND j\$<>"Football league match" THEN PRINT AT 16,8;"Drawn Away" 451 IF fix=0 AND j\$="Football league match" THEN PRINT AT 16,8;"Home match" 452 IF fix=1 AND j\$="Football league match" THEN PRINT AT 16,8;"Away match" 453 IF lgin=1 THEN PRINT PAPER 1; INK 7; AT 20,8;"League Champions" 454 IF cpin=1 THEN PRINT INK 7; PAPER 2; AT 21,8;"Cup Holders" 455 PAUSE 0 461 LET pm=mon 470 BORDER 4: PAPER 4: INK 0: CLS 471 PRINT INK 2; PAPER 7; AT 1,2;y\$;"S quad Division ";dv 472 PRINT AT 0,8;"Players picked ";pick:AT 3,1;"No.Player.....Sk.###...gs.pdfi"; OVER 1;AT 3,1; 480 FOR x=1 TO 15 490 PRINT AT x+4,1;x:AT x+4,4;s\$(x):AT x+4,16;j(x):AT x+4,19;"#";j(x)*INT (100/0/dv):AT x+4,26;g(x); PAPER 6; INK 1;AT x+4,29;k\$(x): BEEP .01,x 500 NEXT x 510 PRINT PAPER 6; INK 1;AT 20,0;"pdf i Picked Dropped Fit Injured" 520 IF pick<=11 THEN GO TO 550 530 PRINT PAPER 0; INK 7;"Drop a player": INPUT I\$(1): LET n=VAL I\$(1) 531 IF n<1 OR n>15 OR I\$(1)=" " THEN 60 TO 470 532 IF k\$(n)<>"p" THEN GO TO 470 533 LET k\$(n)="d": LET pick=pick-1 </pre>	<pre> 534 GO TO 470 550 PRINT INK 3; PAPER 7;"Pick a player or 0 to play": INPUT I\$(1) 552 IF I\$(1)=" " THEN GO TO 550 553 LET n=VAL I\$(1) 560 IF n>16 THEN GO TO 470 570 IF n<1 THEN GO TO 600 571 IF n=16 THEN GO TO 2900 580 IF k\$(n)="p" OR k\$(n)="i" THEN GO TO 470 581 IF s\$(n)="*" OR j(n)=0 THEN GO TO 470 590 LET k\$(n)="p": LET pick=pick+1: GO TO 470 616 BORDER 5: PAPER 5: CLS 617 IF t\$=1 AND cpfix=1 THEN LET cpfix=0: GO TO 620 618 IF t\$=1 AND cpfix=0 THEN LET cpfix=1 620 PRINT INK 5; PAPER 1; AT 0,11;"*MATCHFACTS*": BEEP .04,23: BEEP .05,14: BEEP .07,11: BEEP .05,21: BEEP .06,30 630 LET x=1: LET ct=0: LET tn=0 640 IF k\$(x)="p" THEN LET ct=ct+j(x) 650 LET x=x+1: IF x>15 THEN GO TO 656 655 GO TO 640 656 IF mor>99 THEN LET mor=99 660 LET ave=ct/11 670 LET ave=INT ave 680 LET opm=INT (RND*90)+8 681 IF dv=1 AND opm<35 AND j\$="Football league match" THEN LET opm=35 690 LET opave=INT (RND*9)+1 691 FOR x=1 TO 12: IF t\$(x)=m\$ THEN LET tn=x 692 NEXT x 693 IF tn<3 AND tn>0 THEN LET opave=opave+INT (RND*2)+1 694 IF tn<6 AND tn>2 THEN LET opave=opave+5 695 IF tn>8 THEN LET opave=opave-INT (RND*3)+1 696 IF opave<1 THEN LET opave=1 697 IF opave>10 THEN LET opave=9 698 IF dv=1 AND opave<3 AND j\$="Football league match" THEN LET opave=3 700 PRINT PAPER 1; INK 5; AT 2,1;"Attributes.....Yours....Theirs" 710 PRINT INK 0; AT 4,1;"Team spirit"; AT 4,17;mor;"%"; AT 4,27;opm;"%" 720 PRINT INK 0; AT 6,1;"Average Skill"; AT 6,17;ave; AT 6,27;opave 730 PRINT INK 0; AT 8,1;"Players Picked"; AT 8,17;pick; AT 8,27;"11" 740 PRINT : PRINT INK 6; PAPER 1; AT 12,10;" Team Tactics": PRINT PAPER 2; INK 7; AT 14,10;"1.Defensive "; AT 15,10;"2.Combination"; AT 16,10;"3.Attacking "; INPUT " Select Tactic 1-3"; I\$(1) 760 IF fix=0 AND j\$="Football league match" THEN BORDER 1: PAPER 1: CLS </pre>	<pre> 761 IF fix=1 AND j\$="Football league match" THEN BORDER 2: PAPER 2: CLS 762 IF j\$<>"Football league match" THEN BORDER 4: PAPER 4: CLS 770 PRINT PAPER 5; INK 1; AT 0,6;j\$ 780 LET hs=0: LET as=0: LET ti=0: LET p=5 790 IF fix=0 AND j\$="Football league match" THEN PRINT PAPER 7; INK 1; AT 2,1;0;y\$;" ";hs: PRINT PAPER 7; INK 1; AT 3,10;m\$;" ";as 791 IF fix=1 AND j\$="Football league match" THEN PRINT PAPER 7; INK 1; AT 2,1;0;y\$;" ";as: PRINT PAPER 7; INK 1; AT 3,10;y\$;" ";hs 792 IF cpfix=0 AND j\$<>"Football league match" THEN PRINT PAPER 7; INK 1; AT 2,10;y\$;" ";hs: PRINT PAPER 7; INK 1; AT 3,10;m\$;" ";as 793 IF cpfix=1 AND j\$<>"Football league match" THEN PRINT PAPER 7; INK 1; AT 2,10;m\$;" ";as: PRINT PAPER 7; INK 1; AT 3,10;y\$;" ";hs 800 PRINT PAPER 6; INK 1; AT 20,12;"*Time ";ti;"*": BEEP .001,33 810 LET rd=INT (RND*3000) 811 IF pick<11 AND rd<90 THEN GO TO 920 813 IF rd=1243 OR rd=1244 OR rd=1245 OR rd=1247 AND fix=1 AND sk>2 THEN GO TO 920 840 IF mor>(opm+2) AND dv=1 AND rd<58 THEN GO TO 900 851 IF mor>(opm+35) AND dv=1 AND rd<80 AND dv>2 THEN GO TO 900 860 IF ave>(opave+2) AND rd>2910 THEN GO TO 900 861 IF ave=opave AND VAL I\$(16)=3 AND rd<70 THEN GO TO 920 862 IF opm>mor AND VAL I\$(16)=3 AND rd<70 THEN GO TO 920 870 IF ave>opave AND rd>2930 THEN GO TO 900 871 IF mor+30<opm AND rd<58 THEN GO TO 920 872 IF mor+2<opm AND rd<58 AND dv>2 THEN GO TO 920 874 IF ave+2<opave AND rd>2900 THEN GO TO 920 875 IF ave<opave AND rd>2930 THEN GO TO 920 876 IF dv=1 AND ti>52 AND rd>2949 AND sk>2 THEN GO TO 920 888 LET ti=ti+1: IF ti=46 THEN GO TO 895 889 IF ti=91 THEN GO TO 960 890 GO TO 800 895 PRINT INK 7; AT 21,10;"Half-Time ";hs;"-";as: BEEP .04,5: BEEP .06,23: BEEP .05,30: PAUSE 150: PRINT AT 21,10;" "; GO TO 790 </pre>
---	--	---

PROGRAMMING: SPECTRUM

900 IF hs=7 THEN GO TO 790	907 BEEP .05,3: BEEP .05,1: BEEP .02,16	920 LET ri=INT (RND*10)+1: IF ri=10 AND
901 LET ri=INT (RND*10)+1: IF ri=10 AND	: BEEP .08,30: BEEP .04,21: BEEP .03,18:	fix=0 AND dv>1 THEN GO TO 790
fix=1 THEN GO TO 790	LET hs=hs+1	921 IF VAL 1\$(16)=1 AND ri=4 THEN GO T
902 IF ri=9 AND ski=4 THEN GO TO 790	908 LET re=INT (RND*10): LET n\$=""	0 790
903 LET ri=INT (RND*10)+1: IF ri=10 AND	909 IF re=4 OR re=9 THEN LET n\$="(Pen)"	930 IF ri=3 AND ski=1 THEN GO TO 790
fix=1 THEN GO TO 790	"	931 IF as=7 THEN GO TO 790
904 IF ri=1 OR rd=3 THEN GO TO 790	910 PRINT INK 7; BRIGHT 1;AT ps,6;s\$(s	940 BEEP .06,21: BEEP .02,6: BEEP .08,3
905 LET sc=INT (RND*15)+1: IF VAL 1\$(16)	c);n\$;" ;ti;" Mins": BEEP .06,22: LET g	0: BEEP .01,1: BEEP .04,27: BEEP .03,28:
=1 AND ri=4 OR ri=7 THEN GO TO 790	(sc)=g(sc)+1	LET as=as+1
906 IF k\$(sc)◎"p" THEN GO TO 903	911 LET ps=ps+1: GO TO 790	950 GO TO 790

PROGRAMMING: BBC/ST

File Transfer

Stephen Potts

If you're upgrading from a BBC to an Atari ST computer and don't want to have to retype all your word processing documents, or you want to use an ST at home then port files across to a BBC then we have the system for you. You can even load BBC Basic programs into the ST, to be converted using a word processor, then loaded into whatever ST Basic you use.

The port to use on the BBC Computer is the serial port otherwise known as the RS423 port. The equivalent port on the Atari is the Modem port. To connect them you need a 5-pin DIN plug for the BBC Computer and a D-type connector for the back of the Atari. The cable should be three or five core and less than twenty metres long to avoid signal loss or the pick up of stray signals.

The diagram shows connections for the RS423 ports. The signal ground on both ports should be connected together. The data out on the BBC Computer should be connected to the data in on the Atari and the data out on the Atari connected to the data in on the BBC Computer.

Before transmission can take place it is necessary to convert any files to be transmitted into pure Ascii format. In the case of Wordwise files this is done by loading the file in the usual way and then selecting the option for spooling text. In response to a request for the file name use SPL since this is what the transmit program is looking for. I

have found it to be of greatest use when I leave the Justification off and the left margin off. This will allow maximum versatility when manipulating the text in 1st Word.

For Basic programs it is necessary to convert them from their tokenised form to Ascii form using Spooling. Load the program to be transmitted and then type *SPOOL SPL return followed by LIST. The program should list slowly up the screen as it is saved to disc. When this is complete then enter *SPOOL to close the file.

To set up the ST to receive information it is first necessary to switch on the computer with the Language disc in the drive. This will allow the Desk accessories to be called from the command line at the top of the screen. The "Set RS232 Config." option should be selected. The RS232 port should be set to: Baud Rate 300, Parity NONE, Duplex HALF, Bits/Char 8, Strip Bit ON, Xon/Xoff OFF and Rts/Cts OFF. The panel can then be closed using the OK box.

It is now necessary to load up the Basic disc and enter one into the ST.

Once both the programs are loaded and the connecting lead from the ST Modem port to the BBC is in place then it only remains to start the transfer. Run the ST program so that the receiving computer is ready first. Once this is done then you can run the BBC program. Data transfer should now take place. The speed is not earth-shattering since there are only 300 characters per second being transferred but since it is not envisaged that the programs will be used in a real time application the time is not critical.

After the transfer has taken place then the computers can be disconnected and the data manipulated as required. Wordwise files will have lines that are too long but

this is corrected by holding down the Reformat key until the end of the file is reached. It is then necessary to go through the file and remove spurious carriage returns and reformat each paragraph. This takes very little time compared with retying a whole file.

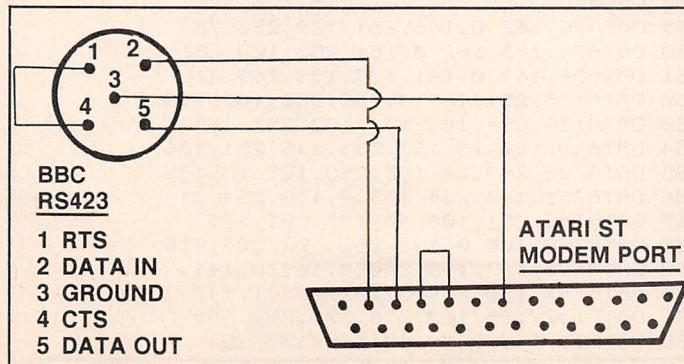
In some ways it is fortunate that Atari Basic uses Ascii files for program storage instead of tokenised files as found on Commodores and BBCs. The advantage is that we can read Ascii files for the word processor straight into Basic.

A Basic program that has been ported to the ST will still need modification before it is run. The easiest way to do this is to load the program into the word processor. Once this has been done then select the Edit option from the Menu bar and deselect the WP mode. If you now save the program it will be saved as a pure Ascii file without the ruler or any control codes. This will allow you to load it straight into Atari Basic.

There may be times when you wish to transfer data from the Atari to the BBC Computer so for completeness I am including the programs to do this.

On the Atari this is program three, and on the BBC, program four.

A similar procedure to that already outlined then has to be followed to transfer the files. The transfer of Fast Basic files to the BBC Computer is a little more difficult. Load the Fast Basic program into the computer and then create a block by dragging the marker across it. The file is then saved to the clipboard by dragging it across to the clipboard. This file can then be saved by dragging the Clipboard icon to the disc drive icon. The file that is thus formed will be an Ascii file which can be transferred to the 1st Word or to the BBC Computer.



PROGRAM 1

```

10  FULLW 2 : CLEARW 2
20  OPEN "O", #1, "DEST.DOC"
30  X=INP(1)
40  IF X>32 AND X<127 THEN PRINT#1,CHR$(X);
50  IF X=32 OR X=13 THEN PRINT#1,CHR$(30);
60  IF X=13 THEN PRINT
70  PRINT CHR$(X);
80  IF X=127 THEN CLOSE #1:END
90  GOTO 30

```

PROGRAMMING: BBC/ST

PROGRAM 2

```

10 REM Set up Serial port for 300 baud.
20 *FX8,3
30 REM Set up screen and RS423 for output.
40 *FX3,5
50 Chan=OPENIN "SPL"
60 REPEAT
70     Byte=BGET#Chan
80     PRINT CHR$(Byte);
90 UNTIL EOF#Chan
100 PRINT CHR$(127)
110 *FX3,0
120 CLOSE#Chan

```

PROGRAM 3

```

10 FULLW 2: CLEARW 2
20 OPEN "I",#1,"SOURCE.DOC"
30 WHILE NOT EOF(1)
40     X$=INPUT$(1,#1)
50     X=ASC(X$)
60     IF X>31 AND X<127 THEN OUT 1,X
70     IF X=30 THEN OUT 1,32
80     IF X=13 THEN OUT 1,X
90     PRINT CHR$(X);
100    WEND
110    CLOSE #1
120    OUT 1,127

```

PROGRAM 4

```

10 REM Set up Serial port for 300 baud.
20 *FX7,3
30 REM Set up RS423 for input.
40 *FX2,1
50 Chan=OPENOUT "SPL"
60 REPEAT
70     Byte=GET
80     BPUT#Chan,Byte
90     PRINT CHR$(Byte);
100 UNTIL Byte=127
110 *FX2,0
120 CLOSE#Chan

```

PROGRAMMING: C64

Handycalc

David Green

THIS two part program simulates a four function calculator. The program is interrupt driven and is as transparent as possible to most Basic and machine code programs.

The loader installs the machine code at \$C000-\$C8B0 and deletes itself. It is important that any machine code programs should not use this space or alter the IRQ interrupt vector at \$314-\$315.

```

1 REM ****
2 REM *
3 REM * HANDYCALC :D GREEN 28/4/87 *
4 REM *
5 REM ****
6 :
7 :
8 POKE53280,6:POKE53281,6:PRINT"13 LOADING...."
9 MC=49151:B=0:C=0
10 READA:IFA=-1THEN13
11 B=B+A:C=C+1:POKEMC+C,A
12 GOTO10
13 IFB<>265182THENPRINT"3 ERROR IN DATA":STOP
14 PRINT"1":SY549152:NEW
15 DATA32,40,198,169,15,141,24,212
16 DATA169,96,141,1,208,169,64,141
17 DATA0,208,141,2,208,141,3,208,169
18 DATA1,141,39,208,141,40,208,169
19 DATA3,141,16,208,169,14,141,248
20 DATA7,169,13,141,249,7,169,3,141
21 DATA21,208,169,0,141,184,198,120
22 DATA169,75,141,20,3,169,132,141
23 DATA21,3,88,96,169,0,141,195,198
24 DATA76,154,200,173,0,220,74,176
25 DATA12,72,173,1,208,201,41,144
26 DATA3,206,1,208,104,74,176,12,72
27 DATA173,1,208,201,239,176,3,238
28 DATA1,208,104,74,176,35,72,173
29 DATA16,208,41,1,208,7,173,0,208
30 DATA201,14,144,19,56,173,0,208
31 DATA233,1,141,0,208,176,8,173,16
32 DATA208,41,254,141,16,208,104,74
33 DATA176,29,72,173,16,208,41,1,240
34 DATA7,173,0,208,201,75,176,13,238
35 DATA0,208,208,8,173,16,208,9,1
36 DATA141,16,208,104,74,176,23,173

```

```

37 DATA195,198,240,24,238,184,198
38 DATA173,184,198,201,21,208,8,169
39 DATA0,141,184,138,76,215,193,173
40 DATA30,208,76,49,234,173,30,208
41 DATA201,3,208,243,169,1,141,195
42 DATA198,32,231,196,169,0,141,195
43 DATA198,32,242,192,32,52,193,76
44 DATA117,193,120,169,160,133,254
45 DATA169,0,133,251,133,253,169,4
46 DATA133,252,172,196,198,192,0,240
47 DATA28,32,45,193,230,251,206,2
48 DATA230,252,230,253,208,2,230,254
49 DATA165,251,201,231,208,231,165
50 DATA252,201,7,208,225,96,162,0
51 DATA161,251,129,253,76,11,193,162
52 DATA0,161,253,129,251,96,169,176
53 DATA133,254,169,0,133,251,133,253
54 DATA169,216,133,252,172,196,198
55 DATA192,0,240,26,32,110,193,230
56 DATA251,208,2,230,252,230,253,208
57 DATA2,230,254,165,251,201,231,208
58 DATA231,165,252,201,219,208,225
59 DATA96,162,0,161,251,129,253,76
60 DATA76,193,162,0,161,253,129,251
61 DATA96,169,0,141,197,198,169,21
62 DATA133,251,169,4,133,252,169,198
63 DATA133,254,169,137,133,253,162
64 DATA18,160,13,177,253,145,251,136
65 DATA208,249,24,165,253,105,13,133
66 DATA253,165,254,105,0,133,254,24
67 DATA165,251,105,40,133,251,165
68 DATA252,105,0,133,252,202,208,218
69 DATA173,197,198,240,8,169,0,141
70 DATA197,198,76,75,192,169,1,141
71 DATA137,198,169,216,133,252,169
72 DATA21,133,251,169,199,133,254

```

PROGRAMMING: C64

73 DATA169,175,183,253,76,138,193
74 DATA169,0,141,186,193,141,185,196
75 DATA173,1,208,74,74,74,56,233,5
76 DATA141,186,196,173,16,208,201
77 DATA3,208,5,169,32,141,185,196
78 DATA173,0,208,74,74,74,24,109,185
79 DATA198,56,233,2,141,185,196,173
80 DATA185,196,201,24,208,81,173,186
81 DATA198,201,7,208,11,169,56,141
82 DATA190,196,32,231,196,76,125,195
83 DATA201,3,208,11,169,53,141,190
84 DATA198,32,231,196,76,125,195,201
85 DATA11,208,11,169,50,141,190,196
86 DATA32,231,196,76,125,195,201,18
87 DATA208,6,32,231,196,76,128,197
88 DATA201,15,208,6,32,231,196,76
89 DATA16,197,201,17,208,6,32,231
90 DATA196,76,187,196,76,207,192,173
91 DATA185,196,201,25,240,168,201
92 DATA26,240,164,201,28,208,86,173
93 DATA186,196,201,7,208,11,169,57
94 DATA141,190,196,32,231,196,76,125
95 DATA135,201,3,208,11,169,54,141
96 DATA190,196,32,231,196,76,125,195

```

97 DATA201,11,208,11,169,51,141,190
98 DATA198,32,231,196,76,125,195,201
99 DATA113,208,11,169,46,141,190,198
100 DATA32,231,196,76,125,195,201,15
101 DATA208,6,32,231,196,76,71,197
102 DATA201,17,208,6,32,231,196,76
103 DATA140,136,76,207,192,173,185
104 DATA136,201,23,240,163,201,30,240
105 DATA159,201,32,208,96,173,186
106 DATA198,201,5,208,6,32,231,196
107 DATA76,193,196,201,7,208,11,169
108 DATA48,141,130,198,32,231,196
109 DATA76,125,195,201,9,208,11,169
110 DATA55,141,130,198,32,231,196
111 DATA76,125,195,201,11,208,11,169
112 DATA52,141,130,196,32,231,196
113 DATA76,125,195,201,13,208,11,169
114 DATA49,141,130,196,32,231,196
115 DATA76,125,195,201,15,208,6,32
116 DATA231,136,76,185,187,201,17
117 DATA208,6,32,231,196,76,250,197
118 DATA76,207,192,173,185,196,201
119 DATA33,240,153,201,34,240,149
120 DATA26,207,192,0,0,0,0,0,0,0,0,0,0

```

PROGRAMMING: AMSTRAD CPC

Khanda 2

Ian Grainger

Here we are with the concluding slab of Khandal code. Run the Basic loader then type in the data statements. Once the code has been entered correctly save it after the main Khandal 2 Basic

program. Then, you're ready to start debugging. Good luck.

If you can't get it right send £3.00 to 33 Wellfield Road, Wingate, Co Durham TS28 5LA for a copy, and of Khandal 1.

```

10 REM Hex Loader for Graphics
20 REM Written by Ian Grainger
30 REM Copyright 1987
40 :
50 MODE 2
60 FOR add=&9000 TO &96D0 STEP 16
70 PRINT"Enter line ";HEX$(add,4)";"
80 INPUT hex$
90 IF LEN(hex$)<>32 THEN PRINT"incorrect amount of data, please re-type."
:GOTO 70
100 INPUT "Enter check at end of line.";ch#
110 ch#=0:FOR f=1 TO LEN(hex$) STEP 2
120 by=VAL("&"+MID$(hex$,f,2)):ch=ch+
by
130 POKE add+(f/2)-1,by
140 NEXT
150 IF ch<>VAL("&"+ch$) THEN PRINT"N
o-check. Totals are incorrect. Please re-type.":GOTO 70
160 NEXT
170 PRINT"Insert your cassette and get ready to save data, after the main program."
180 SAVE "data",,;&9000,;&6E0
    Graphics Data for Khandal II
9000 : 00000000070F0B00403F0C00E010F0E,018C
9010 : 00A10F0E6A10F0E5F48F0F0E5F0F0E,0234
9020 : 070D0F0C00000F0C00070F0E00072FA88,0267
9030 : 0070F0E00070F0E00070F0E000E06F0,00E0
9040 : 00F0F0T00F0T00F0T00F0T00F0T00,0940
9050 : 00F0T00700F0T0072FEE800708487,07C9
9060 : 00F0T93510E0100120E200030481C0,0873
9070 : 36467821C030F3380010F3F880033,06F4
9080 : FFB8003300000030F0000070F080043,022D
9090 : 0F0C00E10F0E00A10F0E06A10F0E0F48,02F5
90A0 : 0F0E0F0F0E0F070D0C0000F0C00007,0084
90B0 : 0F0B0072FAB80070F080070F000070,067B
90C0 : D0E000F0E000F0E000E00070F0E000F0,0A80
90D0 : E0E000F0E000F0E000E00070F0E00072,09C2
90E0 : FE00D0708400070F84860070B4C00030,05FA
90F0 : B480003034000010184000000E0000033,046F
9100 : EEE00033E0FF88003300000000030F,03D8
9110 : 0000070F0800430F0C00E010F0E00A10F,022A
9120 : 0E06A10F0E0F48F0F0E0F0F0E070D0F,01A7
9130 : 0C00050F0C00070F0E00072FAB80070F0,0344
9140 : B00070F0C00070D0E000F0E000F0E000F0,08F0
9150 : 7000E178F000C578F00C370E000F0E00,0867
9160 : 000070F0C00072FEC0070B4C000F084,07E4
9170 : C010B049010B0D28030941C0006F80,0B83
9180 : 7B21C03033308010F3FF8B0033F8B00,0773
9190 : 330000000000F0C00010F0E00030F2C00,00AA
91A0 : 070F7800070F5800070F58006070F2D0F,01C2
91B0 : 070F0F030F020E030F0D00010F0E000,09C
91C0 : 11F5E40010F0E0030F0E00070E0E000,07CA
91D0 : F070F0E000F0E000E0F0E000F0E000,0A90
91E0 : E0F0F0E00F0E000F0E00017F7E400,0A22
91F0 : 1ED2E0003C1F010010F078B0070B480,0779
9200 : 301B2D0E061C0FC0C304F8C010C0,0948
9210 : C0011FFCC0011FF00000000F0C00001,03D4
9220 : 0F0E00030F2C00070F7800070F580007,015E
9230 : 0F5806070F2D0F070F0F030F0E03,0121
9240 : 0F0D00010F0E0011F4E0100F0E00030,0434
9250 : F0E00070B0E0070F070F070F070F070,07E0
9260 : 70F0F070F070F070F070F070F070F070,0740
9270 : 70E00003F7E400072D0E016D2E00030,06D6
9280 : D2E000102C00102C00000002800000,0648

```

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Hex Dump

Paul Roberts

Here's a handy one liner for the Spectrum which converts bytes into hex as it runs through the computers memory.

When run the routine asks for a address to start converting from.

```
1 DEF FN h$(n)=CHR$(n/16+47.5+(7 AND
n/16)=10))+CHR$(n-INT(n/16)*16+48+(7
AND n-INT(n/16)*16>9)): CLS : INPUT "St
art address ";s: FOR a=s TO 65535: PRINT
CHR$ 13+STR$ a+" "(LEN STR$ a TO )
AND (a-s)/8=INT((a-s)/8);FN h$(PEEK a);
" ";: NEXT a
```

Doke

R A Sherwood

This C64 routine allows the user to input a number in the range 0-65535 which can be poked into a two byte location. The syntax is as follows:

Sys 39750, address, value

```
100 REM DOKE
110 REM BY R.A. SHERWOOD
120 A=39750:CH=0
130 READD:IFD=999THEN200
140 POKEA,D:CH=CH+D
150 A=A+1
160 GOTO130
200 READD:IFCH>0THEN250
210 PRINT"DSAVE BEFORE USE"
220 END
250 PRINT"ERROR IN DATA"
260 END
500 DATA32,253,174,32,136,173,32,247
510 DATA183,165,20,133,251,165,21,133
520 DATA252,32,253,174,32,136,173,32
530 DATA247,183,165,20,160,0,145,251
540 DATA165,21,200,145,251,96,999,5267
READY.
```

Halt

Mario Richard

This C64 program aids debugging by letting you pause a Basic program by pressing the Shift key.

Type in the program and run it to place it in memory. Now load the target program and enter Sys 5120:Run.

```
10 FOR X=5120 TO 5147:READ A
20 POKE X,A:NEXT X
30 DATA 120,163,13,141,40,3,163,20
40 DATA 141,41,3,88,96,165,145,201
50 DATA 127,240,6,165,211,201,1,240
60 DATA 244,76,110,246
```

READY.

Attention!

Unfortunately due to the sheer volume of submissions our returns department has been unable to cope satisfactorily. So, from next week onwards we are requesting that you include a suitable stamped addressed envelope for return of your submissions. Not enclosing a suitable one will mean that your program will **not** be returned. You have been warned.

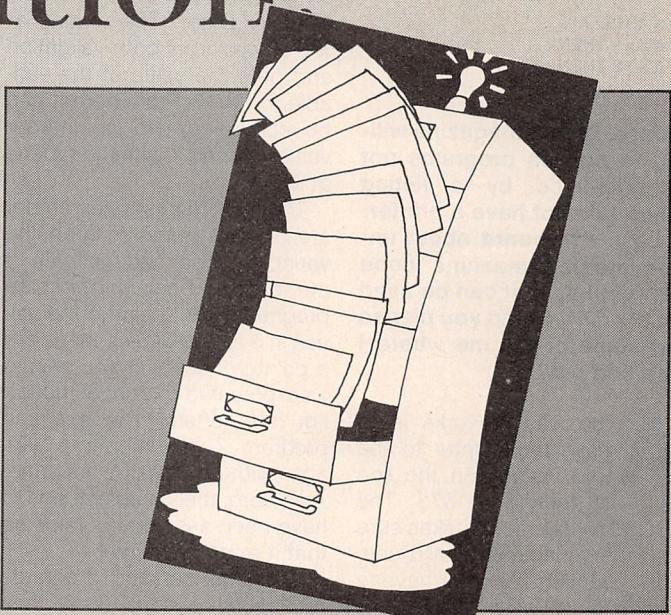
The beneficial side of this system is that 90% of submissions will be returned within one week. A small price to pay for such a service I'm sure you'll agree.

At present we still have a large number of submissions to be returned. These will still be sent back. In fact around half of these have been returned within the last couple of weeks. Bear

with us and we'll get the rest back as soon as possible.

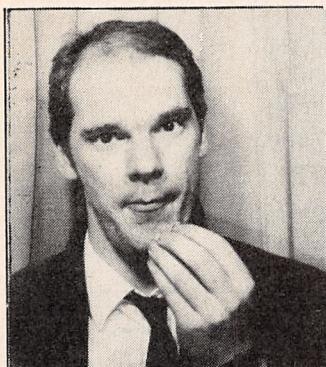
With regards to future submissions, what are we looking for? Well, firstly, articles on programming in general, utility programs and applications software and lastly, good games. In order to save all of us the time and effort here are a few types of programs I never want to see again. Hangman, pools predictors, mastermind, flashing borders, ordinary screen dumps, bank accounts, shoot the blob games and clocks.

Finally, please thoroughly test your programs before you send them in. Although all programs are tested we just don't have the time to spend four hours using something to make sure there are no obscure bugs. If you can't get a program to work ring in to see whether it



was faulty rather than writing. If later, there were problems then we'd let you know. Corrections normally appear a couple of weeks

Thanks
Duncan Evans
Technical Editor



with Kenn Garroch

Machine code variables

Michael Grant, of Nuneaton, Warks, writes:

Q I've been working in machine code on my C64 for a while now and have written a few routines. But now I'd like to put the answer of a routine into a variable, ie, SYS 49152, variable%.

I believe there is an inbuilt Rom routine at 45195 (\$B08B) which will check the variable pointed to by the text pointer and put a pointer to its location in b 95 and 96 (\$5F and \$60). The trouble is that I cannot figure out how to put a found answer into it. The kind of variable would best be an integer, always positive and less than 255. So a program could be written as follows:

```
SYS 49152,A%
IF A%=1 THEN ...
IF A%=2 THEN ...
etc.
```

Also, is your magazine willing to publish programs not accompanied by a listing since I do not have a printer.

Last, I've heard about undocumented machine code instructions that can be used on the C64. Could you please list some or tell me where I can find out?

A The way it works is to move the pointer to the next variable in the line with the routine at &73. The \$B08B routine then makes sure that the variable is a valid one. This means that you will have to assign a value to the variable beforehand. The pointers to the variable name are set up at the time of validation.

To assign a value to the variable in this case, floating

point is easier than integer. Put the value in floating point accumulator 1 (FAC1) and then push the contents of locations 8 and 7 onto the stack, and finally jump into the LET routine to set the value.

To access the routine from Basic, use Program One and:

```
10 A=1:REM any variable will do
20 SYS 49152:A
30 PRINT A
```

A will then contain the new value.

```
Prog 1
*+$C000
JSR $73
JSR $B08B
LDI $100
LDA $40
JSR $B391
LDA $8
PHA
LDA $7
PHA
JMP $A9BA

Prog 2 assembly code
*+$C000
JSR $73
JSR $AF28
JSR $B1AA
INY
BNE NOHI
;point to next variable in the line
;validate name and get floating value to FAC1
;convert to integer in Y and A being the high byte
;as two bytes
;do high byte if necessary
TXA
;using X since INC A is not allowed
;convert to floating point in FAC1
;do this bit to reassign
LDA $8
PHA
LDA $7
PHA
JMP $A9BA ,exit through LET
```

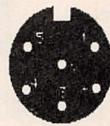
It is also possible to get the contents of a variable, operate on it, and then return the new value to Basic. The routine at \$AF28 performs both validation and gets the value of the variable to FAC1. From here it can be converted into an integer value in A and Y with the routine at \$B1AA.

The main things to remember are that it is best to grab the variable name and validate it etc at the beginning of the program. Don't change the values in \$45 and \$46 as these are a pointer. I suspect you should also preserve 7 and 8 though I'm not certain. The example program 2 increments a variable with SYS 49152:varname. As before, the variable needs to have been assigned a value so that it exists in memory.

As far as sending programs to *Popular* is concerned, they do not have to have a listing accompanying them. But they do need a working copy of the program, any essential program notes (written out) and an SAE.

There are undocumented codes on nearly all microprocessors. The way to find them is to use a monitor and then insert unused instruction codes into a program and see the results. You shouldn't really use the undocumented codes for programs others are to use, as they will probably not work on all 64s. Offhand, I don't know of any codes (though there certainly are some) and I don't know where you can get hold of them.

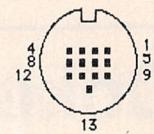
1 Red
2 Green
3 Blue
4 Sync
5 Ground
6 LUM



Amstrad monitor plug from front.

The ST connections are:

1 Audio out
2 Composite video
3 GP out
4 Mono detect
5 Audio in
6 Green
7 Red
8 Ground
9 Horz sync
10 Blue
11 Monochrome out
12 Vert sync
13 Ground



Atari ST Video socket.

How to build a mouse

R Frost, of Bow, London, writes:

Q Many thanks for your reply to A Harvey (*Popular*, October 16-22) concerning linking Atari STs to the Amstrad colour monitor. I kept the piece waiting for the bucks to buy an ST.

I can add some notes to your advice, which was spot on, namely that Videk (26 Queensbury Station Parade, Edgware, Middlesex HA8 5NR) supplies the Atari monitor connector and lead. Tandy sells the 6-pin in-line socket. The connections are, as you say, using the horizontal sync on the single sync on the Amstrad monitor. The vertical sync is not connected and the picture does drift. Advice from Amstrad to short the two Atari syncs as one was not successful. Any ideas welcomed.

The LUM or sixth pin on the Amstrad monitor does not function and is superfluous. I disconnected this inside the monitor and used it as an Audio into a 16Ω speaker which I fixed inside the monitor.

I did not get your advice on holding the Amstrad sync and the Atari monochrome detect high (whatever that means). The monitor does work well anyway so I left it.

Next project, how to turn an old tracker ball joystick into a mouse. Any ideas on the rewiring and how it works?

A That was quite a while ago so a quick recap is in order. The Amstrad colour monitor is RGB and has the inputs:

So connecting the red to red, blue to blue, green to green, ground to ground, and the Atari horizontal sync to the Amstrad sync should give a picture, and apparently does. If there is a bit of drift, try adjusting the vertical or horizontal hold at the back of the monitor.

The Atari ST monochrome detect is used by the machine to tell whether a B/W monitor is being used, in which case it should be grounded. It is normally pulled high (5 volts) by an internal resistor. When using the ST with the Amstrad, or any colour monitor, the mono detect can be ignored.

Now to the tracker ball. The simple answer is to turn it upside down, lo and behold, a mouse - well a hamster at least.

Seriously, a tracker ball should work in the same way as a mouse, see Figs 1 and 2 and substitute a tracker ball for the rubber ball. What you need to find are the connections to the two pairs of detectors. With these, you should be able to work out the direction of travel since one pulse from a detector always precedes the other for a given direction.

Take one detector pair (Fig 2) and say the disc is moving to the left. The right detector comes on first, followed by the left detector, telling the computer that the disc is moving to the left.

What it all boils down to is that you should be able to connect the tracker ball directly to the mouse port, providing you get the connections right. Disassemble your mouse to find out which connection is which (usual considerations about warranty apply). You may need to alter the software a little,

Music to the budget-minded musician's ears

Budget Midi synth modules, although easy on the pocketbook, can be difficult to edit. Micro editing packages can help to ease things, and here Mark Jenkins reviews one for the ST.

The software sequencer market seems to be closing up now with Hybrid Technology and UMI dominating the BBC side of things, a wide variety of options from Microdeal's £50 Super Conductor to the £550 Hybrid Arts SMPTETrack for the Atari ST and DHCP offering the only real choice for the Amstrad CPC.

PC music software isn't really geared to the cost level of the Amstrad PC yet, and as for the Amiga, there's no professional Midi sequencer package available in the UK as yet. The C64 market is pretty evenly divided between fans of Steinberg's Pro-16 (which offers a score writing option) and C-Lab's Supatrack, which is perhaps a little more powerful in everyday use.

So you know what sequencer you're going to use if you've exhausted the possibilities of the built-in sound chips. But as noted over the last few weeks, the cheapest and most powerful Midi synth modules tend to be difficult to edit; luckily, micro packages to help out are now available for many popular synths.

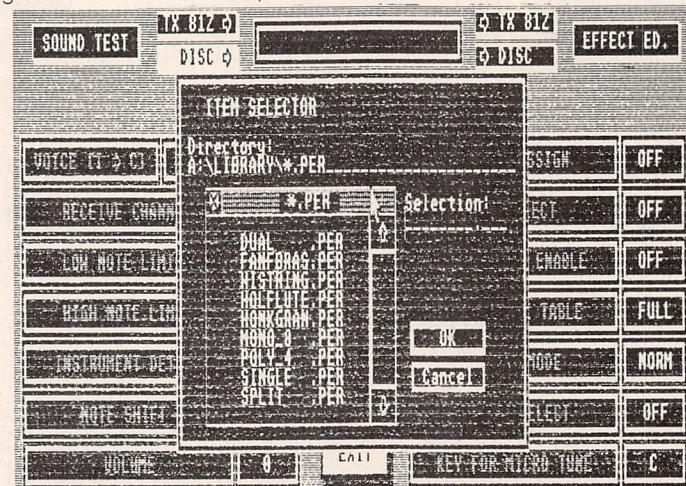
For instance, the Soundbits Voice Master disc for the Yamaha TX81Z (on the ST and distributed by Syndromic Music) makes it much easier to create new sounds on this 19-inch mounting, one-unit, eight-note multi-timbral FM synth. Even the built-in effects on the TX such as delay and pan are handled, and everything is presented in a clear graphical manner.

The main screen simply lists two banks of 32 sounds and allows you to transfer single sounds or whole banks to disc or to the synth. The Performance Editor page arranges these sounds, assigning a certain number of voices (up to a total of eight) to each one and on the Effect Editor page you can choose a stereo pan position for each. Also on the Effect Editor page is the Delay list, which allows you to assign level, time, pitch and feedback.

You can produce a graph of all the envelopes involved - this function wasn't implemented on the early review copy - and these along with the library lists can be printed out. There are various Sound Test options which should help you program

without a keyboard being present, and using the Editor page is simply a matter of entering new values for all the parameters listed.

There's also a randomise option with two levels of severity which should help you come up with unusual new sounds. Overall, the TX81Z Editor is well laid-out, comprehensive in operation and a good bet for any



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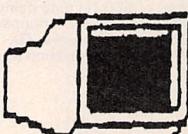
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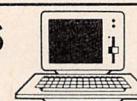
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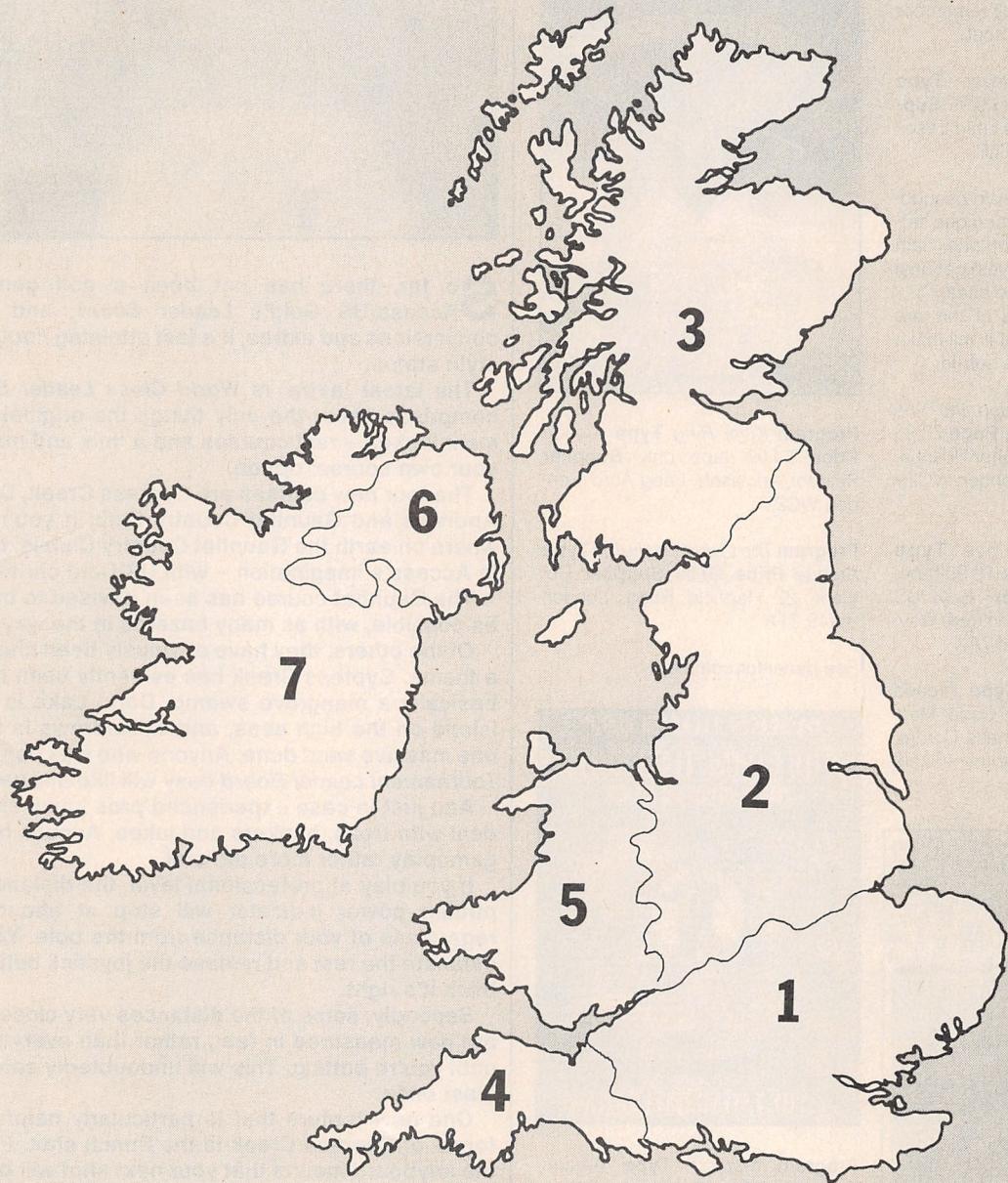
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NEW RELEASES

Your complete guide to all the software released this week

Amstrad CPCs

Program *Shadow Skimmer* Type

Arcade Price £8.95 tape, £14.95 disc

Supplier The Edge, 36/38 Southampton Street, London WC2E 7HE.

One of the slickest smooth scrolling shooters for the Spectrum, it's been a long time coming for CPC owners. Let's hope they can still remember what all the fuss was about.

Program *The Big Sleaze* Type

Spooft adventure Price £9.95

Supplier Delta 4/Piranha, 4 Little Essex Street, London WC2B 3LF.

Fergus McNeil moves from pseudo-Hobbitry to sub-Chandleresque setting for the exploits of one Sam Spillade ("Spillade Investigations: no case too small or too cheap").

As it's McNeil, parts of this are genuinely funny, a lot of it will make you wince. None of it is subtle.

Program *Mr Weems and the She*

Vampires Type Arcade Price £8.95

tape, £13.95 disc Supplier Piranha, 4 Little Essex Street, London WC2R 3LF.

Program *World Games* Type

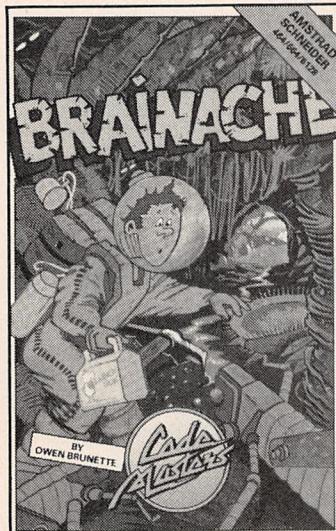
Sports simulation Price £9.99 tape, £14.99 disc

Supplier Epyx/US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

Program *Brainache* Type

Arcade Price £1.99

Supplier Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon. OX16 7BT.



Program *Transatlantic Balloon Challenge* Type Simulation Price £7.95 tape, £12.95 disc Supplier Virgin Games, 2 Vernon Yard, Portobello Road, London W11.

So this is what Richard Branson has

been doing sitting in Maine for the last month or so. There's nothing like testing out your game concepts in real life first, is there?

Let's hope this is a bit more of a game than a bandwagon job, like that transatlantic speedboat challenge we were subjected to last year.



Program *Killer Ring* Type

Arcade Price £4.99 tape only

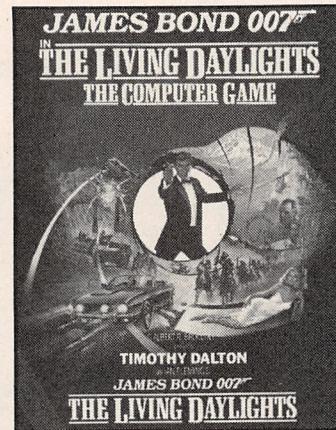
Supplier Reaktor/Ariolasoft, Long Acre, London WC2.

Program *The Living Daylights* Type

Arcade Price £9.95

Supplier Domark, 22 Hartfield Road, London SW19 3TA.

See panel for comment.



Program *Mutants* Type Arcade Price £8.95 Supplier Ocean, 6 Central Street, Manchester M2 5NS.

Amstrad PCWs

Program *Locoscript.2* Type

Word processor Price £19.95

Supplier Locomotive Software, Allen Court, Dorking, Surrey RH4 1YL.

See this week's review.

Program *The Mail Genius* Type

Label printing utility Price £9.99

Supplier Endurance Software, 80 Ravenscroft, Bank Farm, Holmes Chapel, Cheshire CW4 7HJ.

Program *The Living Daylights* Type
Arcade Price £9.95 Supplier Domark, 22 Hartfield Road, London SW19 3TA.

Atari XL/XE

See panel for comment.



So far, there has not been a golf game to touch Access/US Gold's *Leader Board*, and with all its conversions and extras, it's fast attaining *Football Manager* style status.

The latest 'extra' is *World Class Leader Board*, which comprises about the only things the original and *Tournament* lacked - real courses and a 'mix and match to make your own course' option.

The four new courses are Cypress Creek, Doral Lake, St Andrews and Gauntlet Country Club. If you're wondering where on earth the Gauntlet Country Club is, the answer is in Access's imagination - with US Gold christening it.

The Gauntlet course has been devised to be as fiendish as possible, with as many hazards in the way as possible.

Of the others, they have obviously been chosen to run to a theme. Cypress Creek has evidently been carved out of basically a mangrove swamp, Doral Lake is basically an island on the high seas, and St Andrews is portrayed as one massive sand dune. Anyone who was beginning to find *Tournament Leader Board* easy will like this new challenge.

And just in case experienced pros know exactly how to deal with trees, bunkers and lakes, Access has made the gameplay rather more difficult.

If you play at professional level, the distance bar on the putting power indicator will stop at about seven feet regardless of your distance from the pole. You must then estimate the rest and release the joystick button when you think it's right.

Secondly, some of the distances very close to the green are now measured in feet, rather than everything in yards until you're putting. This will undoubtedly catch you out at least once.

One new feature that is particularly helpful in the rain forest of Cypress Creek is the Punch shot. Pressing P on the keyboard means that your next shot will be hit low and skidding over the ground, and hopefully underneath the trees in front of you.

Aside from this, the play is as previous *Leader Boards*, although I found the yardage to add on from the rough varied considerably.

In creating your own course, you are essentially selecting holes from any of the four courses provided, to make your own composite golf club. You can also modify tree types (I'd turn them all into bonsais, given the option). It is not a design from scratch program.

Christina Erskine

GREAT GRAPHICS - BUT WHAT ABOUT THE GAMEPLAY?



Some months back, *Popular's* adventure supplement gasped in awe at an Amiga program called *Defender of the Crown*.

Now it's been converted to the Commodore 64, and it has lost none of its shining graphic presentation and once you've accepted the 64's lower screen resolution, very little of the stunning graphics. And the music, programmed for the 64 by Palace Software's Richard Joseph, is excellent.

Licensed by Mirrorsoft from Master Designer Software in the US, *Defender of the Crown* centres around an American view of mediaeval England.

The country is plunged into war between the Normans and Saxons, each accusing each other of assassinating the king and stealing his crown.

You are approached by Robin of Locksley (wearing a fetching Lincoln green, domiciled in Sherwood Forest and thus unmistakably Robin Hood) to reunite the country.

There's a choice of four Saxon characters to play; Wilfred of Ivanhoe, Geoffrey Longsword, Wolfric the Wild and Cedric of Rotherwood, each with varying

capabilities in the fields of jousting, leadership and swordplay.

Having chosen your alter ego, and taken on the quest, you go off to 12th century England for a packed social calendar of raiding nearby castles, jousting in tournaments, besieging the Normans, and building up your armies.

There are also three Saxon maidens to be rescued from Norman clutches, and suitable favours will be bestowed upon you if you succeed.

Playing the game also involves building up your army according to your income and treasure gathered, deciding how to allocate resources to soldiers, knights, and expensive catapults for storming enemy castles. Your manpower and equipment will partly determine your success in capturing neighbouring territory.

It's also worth spending money on a catapult just to savour the wonderful scene as you let it fly at the nearest fortress. On the Commodore version, you get the chance not only to break the walls down, but also fling 'disease' into the castle to decimate the enemy's manpower.

Or you can conquer the

sneaky way, raiding nearby castles for loot. Here, and in the conquest scenes, swordplay is called for. The raiding scenes show beautifully detailed graphics of a dimly lit mediaeval castle; the screens depicting combat in the field are a bit of a disappointment; tiny characters waving swords over a solid green background.

The tournament scenes, where you can joust for either fame or land are also portrayed with superb large graphics. Getting the hang of jousting techniques is however, something of a challenge.

In fact, it is in the gameplay that the Commodore version lets itself down. It looks beautiful, and sounds great, but where on the Amiga version it was almost easy, on the 64, it's far too difficult to get into.

Despite the addition of a 'power status' bar in the swordplay scenes, your success appears to depend too much on original attributes and very little on skill.

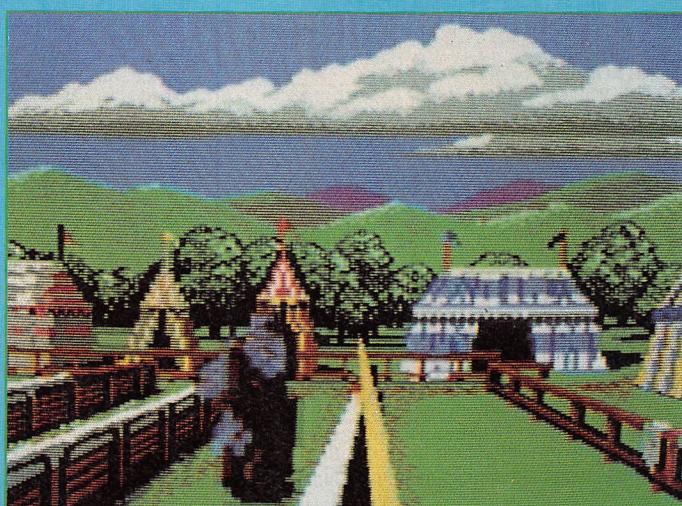
You can't really categorise *Defender of the Crown*. The strategy isn't detailed enough for

strategic purists; it's not really an adventure; all-out zappers will probably find the combat scenes a bit namby-pamby and impenetrable for their tastes.

The game goes under the label of Cinemaware, and includes film-style credits at the beginning and a separate soundtrack for each section of play. It's certainly the nearest thing yet to taking part in a Hollywood view of olde England.

Christina Erskine

Program *Defender of the Crown* **Type** Undefinable **Price** Commodore 64 (disc only), £14.95; Amiga, £29.95; Atari ST version forthcoming **Supplier** Mirrorsoft, Athene House, 66-73 Shoe Lane, London EC4P 4AB.



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◀ continued from page 40

Atari ST

Program *Extensor* **Type** Arcade **Price** £19.95 **Supplier** Diamond Games/Robtek, Unit 4, Isleworth Business Complex, Station Road, Isleworth, Middlesex.

BBC series Electron

Program *Suds* **Type** Text adventure **Price** £4 **Supplier** Riverdale Software, 95 Printon Avenue, Manchester M9 3JG.

Who says the back bedroom software business is dead? Suds is an adventure Quilled by David Edwards, in which you must travel from Yorkshire to London via the Cross Eyes Motel to fulfil your ambition of becoming a soap opera star.

Commodore 16

Program *World Class Leaderboard* **Type** Golf simulation **Price** £9.95 tape, £14.99 disc **Supplier** US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

See panel for comment.

Program *Super Robin Hood* **Type** Arcade **Price** £1.99 **Supplier** Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.



Program *Thunderbolt* **Type** Arcade **Price** £1.99 **Supplier** Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.

Code Masters' style exemplifies the strength of the budget market at the moment. Nothing too taxing, nothing too innovative or mind

bending - just uncomplicated, neatly and cleverly programmed blasters with some excellent music.

Exactly what the majority of zap-pers want and can afford.

Program *Bride of Frankenstein* **Type** Arcade adventure **Price** £8.99 **Supplier** 39 Steps/Ariolasoft, Long Acre, London WC2.

Program *Deceptor* **Type** Arcade **Price** £9.99 tape, £14.99 disc **Supplier** US Gold, Units 2 and 3, Holford Way, Holford, Birmingham B6 7AX.

IBM PCs and Compatibles

Program *Scrabble* **Type** Board game simulation **Price** £24.95 **Supplier** Leisure Genius/Virgin Games, 2 Vernon Yard, Portobello Road, London W11 2DX.

Scrabble goes from strength to strength with each conversion. This version is not afraid of long words, has a 23,000 word vocabulary, includes eight skill levels and a clock (the new version will probably have a kitchen sink thrown in for good measure).

Runs on IBM's PC XT and ATs, and all true compatibles (including Amstrad PC) with CGA or Hercules Mono boards.

Program *KWord2* (512K and Gem only) **Type** Word processor **Price** £59.95 **Supplier** Kuma Computers, 12 Horseshoe Park, Pangbourne, Berkshire.

Program *Gamma Games* **Type** Board game compilation **Price** £14.95 **Supplier** Advance Software Promotions, Unit 1 Harolds Close, Harolds Road, Harlow, Essex CM19 5TH.

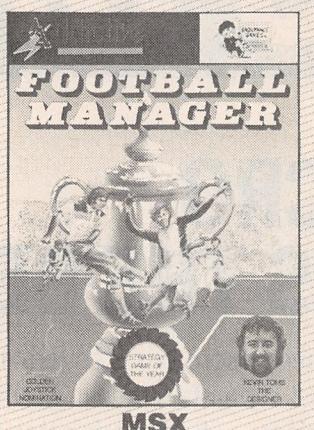
Three board games in one package: chess, backgammon (can you ever satisfactorily emulate the speed and dice hurling of Backgammon on a computer?) and 4-Sight (a variant of Connect-4).

MSX

Program *Football Manager* **Type** Simulation **Price** £8.95 **Supplier** Endurance Games, 28 Little Park Gardens, Enfield, Middlesex EN2 6P6.

I can scarcely believe there hasn't already been an MSX version of *Football Manager*, but apparently not.

Anyway, here's progress for you. This version is the very first *Football Manager* to be written in machine code as opposed to Basic.



Commodore 64

Program *Transatlantic Balloon Challenge* **Type** Simulation **Price** £7.95 **Supplier** Virgin Games, 2 Vernon Yard, Portobello Road, London W11.

See Amstrad for comment.

Program *The Big Sleaze* **Type** Spoof adventure **Price** £9.95 **Supplier** Delta 4/Piranha, 4 Little Essex Street, London WC2R 3LF.

See Amstrad for comment.

Program *Mr Weems and the She Vampire* **Type** Arcade **Price** £8.95 tape, £13.95 disc **Supplier** Piranha,



Beautiful women, fast cars, Russian spies with names like Koskov and Necros, missile-firing fountain pens, outrageous stunts... yes, Bond is back.

That's on the big screen. Unfortunately in the translation to the computer screen some of the ingredients have been lost. What's been retained is Bond, the Russian spies, and some of the gadgetry.

To say that the game follows the plot of the film doesn't mean much, since none of you will have seen it yet. But basically, you have to get the Russian defector to safety, then get him back when he's kidnapped, then confront the evil mastermind.

The action is spread over eight levels, representing eight key scenarios from the movie. Bond races across the scrolling landscape as endless numbers of baddies attempt to stop him with guns, bombs, spanners, helicopters - even exploding milk bottles.

Between the levels, you get the chance to select extra weaponry from Q's gadget shop, but only one of the four items available is any use, so you have to learn by trial and error.

The graphics - at least on the Amstrad version, the only one we've seen - are very good: colourful, well drawn and animated.

The problem is that if you strip away the Bondage, you're left with a distinctly average arcade game. All eight levels play the same, with only the scenery changing.

It's a million miles better than the last Domark/Bond production, but that isn't saying much.

I find it ironic that the best James Bond computer game was nothing to do with James Bond. Anyone remember *Spy Hunter*? Now that's what a Bond game out to be like.

Peter Worlock

continued on page 45 ▶

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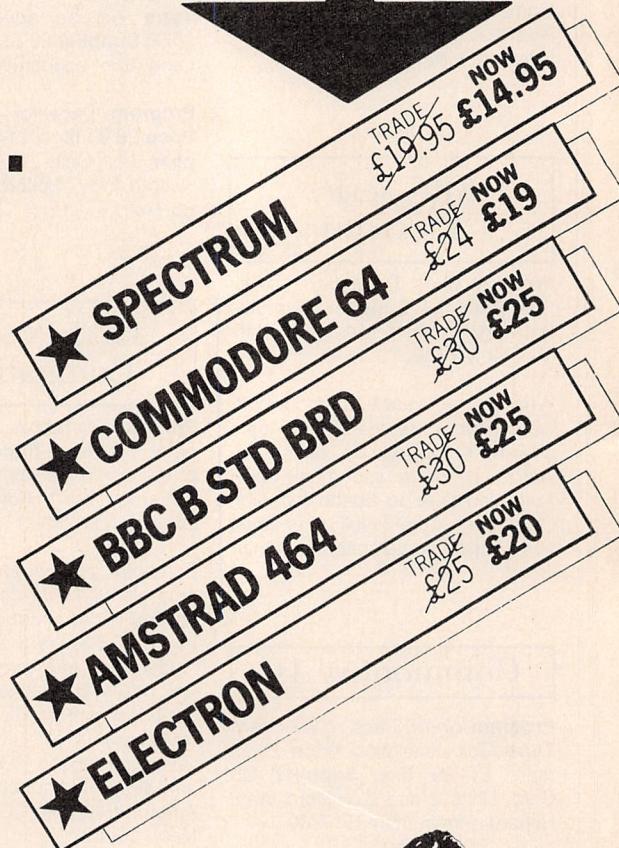
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◀ continued from page 43

4 Little Essex Street, London WC2R 3LF.

Program *Mountie Mick's Deathride* **Type** Arcade **Price** £4.99 **Supplier** Reaktor/Ariolasoft, Long Acre, London WC2H.

The £4.99 quoted above is not a misprint, Ariolasoft (or Reaktor, or 39 Steps, or whatever it's calling itself these days) is selling this, *Killer Ring* and *Deadringer* at a "special holiday offer" price. Some day all 8-bit games will be priced like this.



Spectrum

Program *The Living Daylights* **Type** Arcade **Price** £9.95 **Supplier** Do-mark, 22 Hartfield Road, London SW19 3TA.

See panel for comment.

Program *Championship Baseball* **Type** Sports simulation **Price** £8.99 **Supplier** Activision, 23 Pond Street, London NW3.

Program *Beta Basic 4.0 (128K only)* **Type** Utility **Price** £15.95 **Supplier** Betasoft, 92 Oxford Road, Moseley, Birmingham B13 9SQ.

Look out for full length review in *Popular* coming soon.

Program *Table Football* **Type** Sports simulation **Price** £1.99 **Supplier** Rino Marketing, 1 Orange Street, Sheffield S1 4DW.

Program *Prohibition* **Type** Arcade adventure **Price** £9.95 **Supplier** Infogrames, Mitre House, Abbey Road, Enfield, Middlesex.

Program *Super G Man* **Type** Arcade **Price** £1.99 **Supplier** Code Masters, 1 Beaumont Business Centre, Beaumont Close, Banbury, Oxon OX16 7RT.

Program *Transatlantic Balloon Challenge* **Type** Simulation **Price** £7.95 **Supplier** Virgin Games, 2 Vernon Yard, Portobello Road, London W11.

See Amstrad for comment.

Program *Mountie Mick's Deathride* **Type** Arcade **Price** £4.99 **Supplier** Reaktor/Ariolasoft, Long Acre, London WC2H.

See Commodore for comment.

CHARTS

Top Twenty

1	(1)	Barbarian
2	(-)	The Last Ninja
3	(3)	Milk Race
4	(2)	BMX Simulator
5	(4)	Football Manager
6	(5)	Paperboy
7	(11)	Feud
8	(12)	Gauntlet
9	(7)	Four Great Games
10	(6)	I Ball
11	(14)	Stormbringer
12	(8)	Six Pack
13	(-)	Around the World in 40 Screens
14	(9)	Army Moves
15	(15)	Leaderboard
16	(19)	Konami's Coin-op Hits
17	(-)	Brainache
18	(-)	Tournament Leaderboard
19	(-)	Strike
20	(-)	Ghost Hunters

All figures compiled by Gallup/Microscope

Palace
System 3
Mastertronic
Code Masters
Addictive
Elite
Bulldog
US Gold
Microvalue
Firebird
Mastertronic
Elite
Superior
Imagine
Access/US Gold
Imagine
Code Masters
Access/US Gold
Mastertronic
Elite

Program *Starfox* **Type** Arcade **Price** £8.99 tape **Supplier** Reaktor/Ariolasoft, Long Acre, London WC2.

Program *The Big Sleaze* **Type** Spoof adventure **Price** £9.95 **Supplier** Delta 4/Piranha, 4 Little Essex Street, London WC2R 3LF.

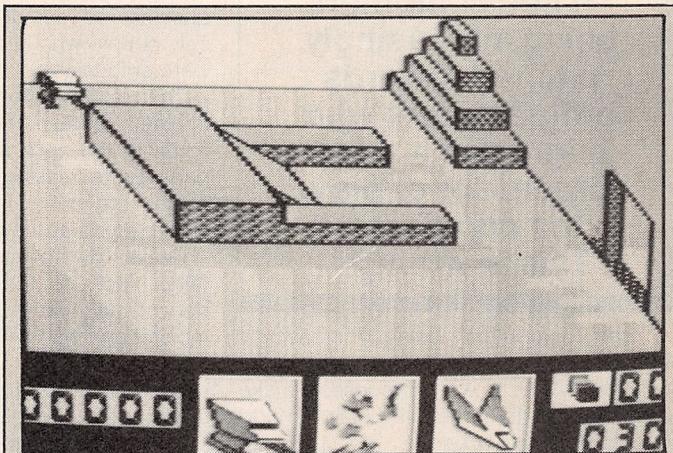
See Amstrad for comment.

Program *Mr Weems and the She-Vampires* **Type** Arcade **Price** £8.99 tape **Supplier** Piranha, 4 Little Essex Street, London WC2R 3LF.

Program *Bride of Frankenstein* **Type** Arcade adventure **Price** £8.99 **Supplier** 39 Steps/Ariolasoft, Long Acre, London WC2.

Program *Castle Thade Revisited* **Type** Text adventure **Price** £2.50 **Supplier** Spectrum Adventurer, 4 Kilmartin Lane, Carlisle, Lanarkshire ML8 5RT.

Another 'cottage industry' text adventure, this time from William Young, the man behind the Spectrum Adventure tape fanzine.



Deceptor is one of US Gold's Canadian originated products - nothing to do with the US at all, and in Artech Digital Products' program, it seems to have found a winner.

Deceptor boasts neat graphics, some distinctly weird sound and an atmospheric setting. You play a transformer: a ground buggy for, well, travelling on the ground, and can turn into a sort of skimmer for flying, and become a humanoid robot for doing battle with the guardian of the gates.

Using your three 'bodily forms', you negotiate a labyrinth of corridors, platforms, ramps and doors, all in solid 3D, and in large graphics (we're not talking spindly platforms and ladders here), ducking and weaving away from various objects, which include enormous tennis balls, and what looks like a floating microscope.

Each part of the course must be completed within a time limit, before you come across the gatekeepers. To defeat them, you must use the ammunition which hopefully you have not neglected to pick up along the way.

Of course, the scenario isn't original. Strange flying objects and labyrinthine corridors have almost been done to death. But the excellent solid graphics and the transforming feature make this seem like a different game altogether. I particularly like the inclusion of a practice mode for controlling your craft and transforming, and the menacing introductory screens where you are sent on your mission.

Just one gripe, it's multi-load on the cassette version to the point of tedium, and our particular tape frequently misbehaved and threw up rubbish on screen. Hope it was just a single dodgy tape, USG.

Christina Erskine

Computer power to the people

One of the things that still amazes me about computing is that it still hasn't shaken off its 'boffin and enthusiasts only' status.

That's a shame because as people's leisure time increases, they still only have traditional kinds of entertainment, and are missing out on the computer's capacity to entertain.

"I see computers being increasingly pitched towards programmers who might use a word processor or play the odd game. This is wrong"

I see computers being increasingly pitched towards programmers who might occasionally use a word processor, make some nice charts and maybe play the odd adventure. This is wrong.

At the moment software producers are chucking out games for eight year olds (with a few exceptions). This is fine while the market holds but those eight year olds are going to grow up and begin to look for more in computer entertainment. They are not going to find what they want.

By seemingly excluding people over the age of 20 from games playing, the companies are missing a very good opening for increased software sales.

Also 'technology acceptance' will increase. To explain that: if we are honest,

computers are rarely accepted, even though so many homes now have at least one. Parents see them only as "this bleepy thing the kids play with". But I can guarantee that if someone persuaded those people to try 'adult orientated software', then they are going to take up computers just as TV, video and radio have been accepted.

A move towards the way video films are marketed and in the video entertainment business, as recently as two years ago, the only people who hired films in any number were enthusiasts.

Then a few strong minded companies decided to take the whole thing by the scruff of the neck and turn it into today's huge profit making industry. Some films make more money from video hire and sale than they do at the box office.

The hardware manufacturers must also take much of the blame for cheapest decent machine (Atari STM) with a colour monitor and disc drive will take you well into the realm of £600. To set up a decent hi-fi system will cost around £350. Comet will sell you a TV/video system for £300.

That makes computer entertainment well out of reach of mere mortals. The demand for a 16-bit, megasound, megographics, megapower £400 set up could be easily created.

Indeed, Amstrad did something very similar with its video recorder (a cheap, quality, reliable, ordinary video).

To sum up, it's going to take someone with enough guts and brains to pull the industry's socks up and commit it to smaller profit margins, but with a vastly increased market size and greater buying public.

Rik Hammond

Puzzle No 264

I have a book of 1,000 pages, each page being numbered in the usual manner from one to 1000.

In order to do this the printer will require a certain number of each of the ten digits, zero to 9.

In my book, can you say which digit is used most frequently, and which is used the least. Also can you say how many times these digits are used in each case?

Solution to Puzzle No 259

Of the codes possible, 2010 of them are 'quick' and 7990 of them are not.

In the program, each number in the range zero to 9999 is generated in sequence. This number is then converted into a string variable, line 50 adding any 'leading' zeros where appropriate. The loop at line 60 then takes each of the first three digits in turn and places its value into variable 'A'. The next digit in the sequence (F+1) is also extracted, but here it is placed into the string variable B\$.

The program then compares the two adjacent digits to determine if they do not form a 'quick' sequence. This is done using the array N\$(), together with the INSTR command.

The array has already been 'loaded' with the sequence of digits that would result in a non-quick number. For example, N\$(0) holds the sequence '456789' since a jump from zero to one of these digits would prevent the number from being 'quick'.

The actual sequences used are found by inspecting the key-pad and entering the relevant digits into the DATA lines. These ten bits of data are then read into the array at the commencement of the program.

Winner of Puzzle 259

This week's winner is D C Mallett, of Croydon, Surrey, who will receive £10.

Rules

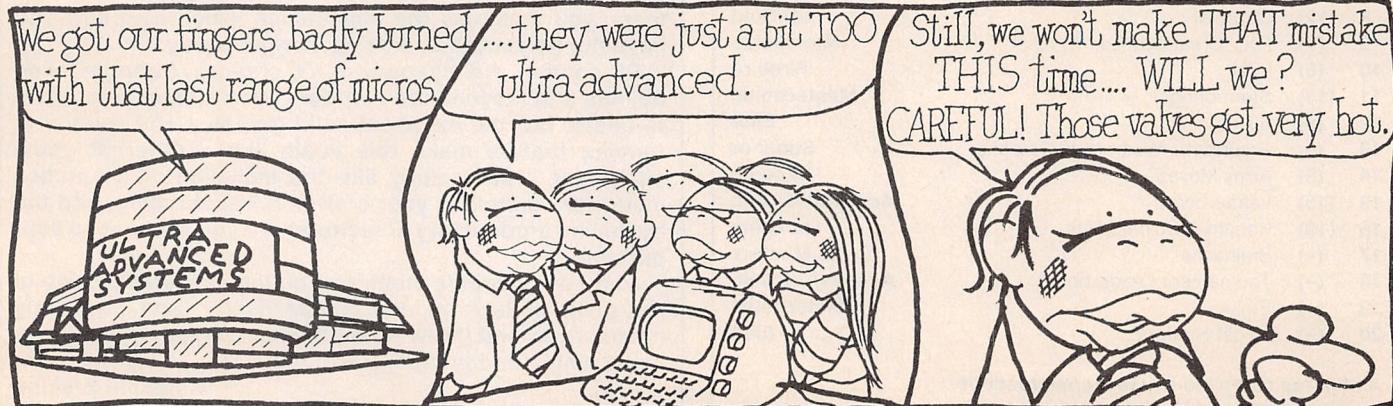
The closing date for Puzzle 264 is July 22.

```

10 DIM N$(9):QUICK=0:SLOW=0
20 RESTORE:FOR F=0 TO 9:READ N$(F):NEXT
30 FOR N=0 TO 9999
40 N$=STR$(N):FL=0
50 IF LEN(N$)<4 THEN N$="0"+N$:GOTO 50
60 FOR F=1 TO 3
70 A=VAL(MIDS(N$,F,1)):B$=MIDS(N$,F+1,1)
80 Z=INSTR(N$(A),B$)
90 IF Z<>0 THEN FL=1
100 NEXT
110 IF FL=0 THEN QUICK=QUICK+1
120 IF FL=1 THEN SLOW=SLOW+1
130 NEXT N
140 PRINT "Quick' numbers:":QUICK
150 PRINT "Slow' numbers:":SLOW
160 PRINT "TOTAL:":QUICK+SLOW
170 DATA "456789","78963","789","14789"
180 DATA "96301","0","7410","963210"
190 DATA "3210","741230"

```

HACKERS

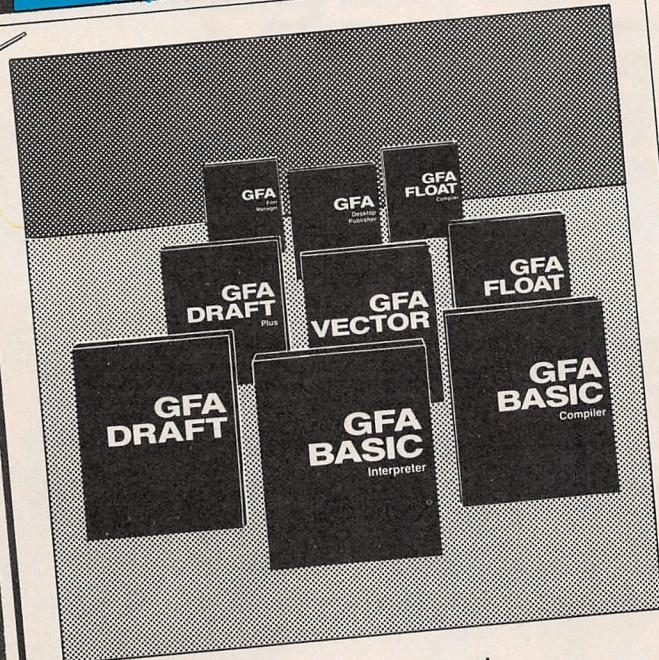


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screen shots from CBM 64/128 version

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